THE LONDON LEAD COMPANY SILVER AND LEAD SALES

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INTRODUCTION

The records of the London Lead Company contain a large number of references to their sales of silver. The frequency of these sales suggests that they were very important to the company's prosperity. In the following pages these sales will be looked at in detail, as well as those factors that influenced the quantity of silver and lead sold.

Previous to the 1st January 1752 the New Year began on Ladyday, 25th March, for ease of understanding the dates given in the following text are all written using the modern system of taking the beginning of the year as the 1st January.

THE EARLY DAYS OF THE LEAD COMPANY.

The London Lead Company was the largest company working on Alston moor in the 18th and 19th centuries. The company was granted its charter by William and Mary on 4 October 1692, having been formed initially as a smelting company. The Company encountered many difficulties, as a result of which it proved unsuccessful, closing on Monday 27 May 1695.

"The Court agreed to the surrendering of the lease on Sadlers Hall for Midsummer next. They asked Thomas Addison to go to Bristol to wind up the Company's affairs. Also, that an inventory of the Company's furniture (in their part of Sadlers Hall) should be made and that it be disposed of."

Dr. Edward Wright who had interests in both the Royal Mines Copper and the Ryton Company, (Ryton smelt mill was on the south bank of the river Tyne) and a group of Friends (Society of Friends - Quakers) had carried out experiments in the smelting of lead and construction of furnaces, but before they could set up in business they had first to acquire the Charter of the Governor and Company. The difficulty they then had, was, that the conditions of the Charter demanded that each member had to swear an oath of allegiance. Fortunately, from 1688 (Act of Parliament Cap. 18, 1688, modified by Cap. 1. 1692 and Cap. 34. 1696) the Quakers principled objection to judicial oaths was recognised, and they were allowed to make a 'statutory declaration' instead.

On February 10, 1704, the Deputy Governor Thomas Addison called a Court meeting of the Governor and Company. Their first business was to admit as members of the Company, and then elect to the Court seven non-Friends who could take the oath. Samuel Davies was elected Governor. Thomas Addison, Sir Hy Marwood, Thomas Renda, Capt. Thomas Nix, John Henly, Sir Talbot Clerk, Richard Adams, George Moore, and Matthias Cupper sold their shares, so forfeiting all offices in the Company. At the next meeting, three days later, it was confirmed that the affirmation of a Quaker was admissible in place of the oaths for entry into the Company. Edward Wright, Cornelius Mason, John Haddon, Jacob Franklin, and Thomas Cooper took the affirmation in lieu of oaths and were then admitted to the Company. They then proceeded to elect a Deputy Governor, Enoch Ffloyd and five assistants; Dr Edward Wright, Cornelius Mason, John Haddon, Jacob Franklin, and Thomas Cooper.

The Quakers were already members of the Ryton Company (Ryton smelt mill) which was closely associated with the company of Royal Mines Copper. These two companies were incorporated into the London Lead Company. The Royal Mines Copper on 13 March 1705 and the Ryton company on the 19 June 1705. These two mergers resulted in the company owning mines in North Wales, and the Pennines along with a Smelt Mills at Gadlis (North Wales), and Ryton.

The new company had the resources to smelt large quantities of lead and from it refine silver. Over the next few years the company expanded the business to include works in Scotland, Ireland, Yorkshire and Derbyshire. Between 1705 and 1731 the company sold over 388,000 ounces of silver, between 1816 and 1869 2,360,872 ounces, and between 1871 and 1899 over 1.5 million ounces.

The first Mention of Silver in the new Company minutes occurs on the 10 July 1705 and mentions cakes of silver weighing 290 oz 15 pw. At this time the silver was sent to the Mint at the Tower of London, where it was used for the production of coinage, the company receiving 5s 2d per ounce. The company later records that seven ingots of silver were sent to the tower.

	pounds	**ounces**	**pennyweights**	**grains**
Ingot No. 1	54lb	8oz	8pw	20gr
Ingot No. 2	47lb	10oz	9pw	10gr
Ingot No. 3	46lb	3oz	6pw	16gr
Ingot No. 4	53lb	10oz	17pw	12gr
Ingot No. 5	58lb	1oz	4pw	18gr
Ingot No. 6	48lb	10oz	8pw	11gr
Ingot No. 7	69lb	2oz	19pw	19gr
TOTAL VALUE		£1174	15s	5d

The company decided that they would apply to the Lord High treasurer for an emblem to be placed on coinage (known later as Roses and Plumes coins) made from the silver of the company. The minutes of 10 December 1705 record that they resolved:

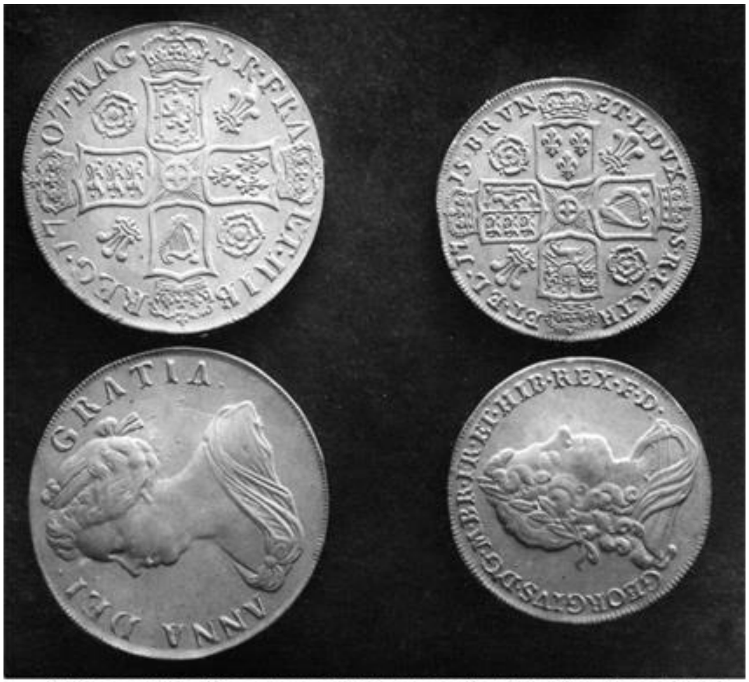
“That in as much as the corporation doth make silver both in England and Wales the Lord High Treasurer be petitioned for Two Roses and Two Feathers quartered as the emblem of England and Wales.”

A petition was sent to the Treasury requesting this and the minutes of 8 January 1706 record:

“The Lord High Treasurer had been pleased to refer the petition of this company to the officers of the mint and that the said officers had been attended with the charter and that the report of that Board was gone back to the Treasury in favour of this Corporation so that it is not doubted but a warrant for the distinction on the coin made of this company’s silver will be obtained.”

The warrant from Queen Anne was received in 1706, the following being recorded in the minutes of the 30 April 1706.[1]

“The Deputy Governor reported that he had been at the Treasury and that he had brought down the warrant from the Queen for a mark of distinction on the coin of the Company’s silver and delivered it to the mint, and that the charges of obtaining the same came to £5 14s 6d.”



Coinage of the Governor and Company for Smelting Down Lead with Pit Coal and Sea Coal

Carlisle Archives: Dx2282

The company continued to sell their silver to the mint, but as the price of silver increased on the open market they realised that they could make more money if they did not sell to the mint, but to silver merchants instead. The first record of this occurring is in a minute of 28 February 1744 when they sold 2 ingots of silver weighing 567 oz. 10 pw. to John Blatchford at 6 shillings an ounce. By August 1750 the vast majority of their silver was being sold to Alderman Blatchford, with only occasional sales to the Mint.

On the 30 January 1766 the company received a letter from the solicitors of the Mint.[2]

"Gentlemen

I waited on you today by direction of the Mint to acquaint you that they have not at present any silver in the office and as the coinage of the small money for the Maunday approaches the office is under a necessity of reminding you of the terms of your charter and to desire you would forthwith order some silver to be sent in as the same as always appropriated for the service of the Maunday."

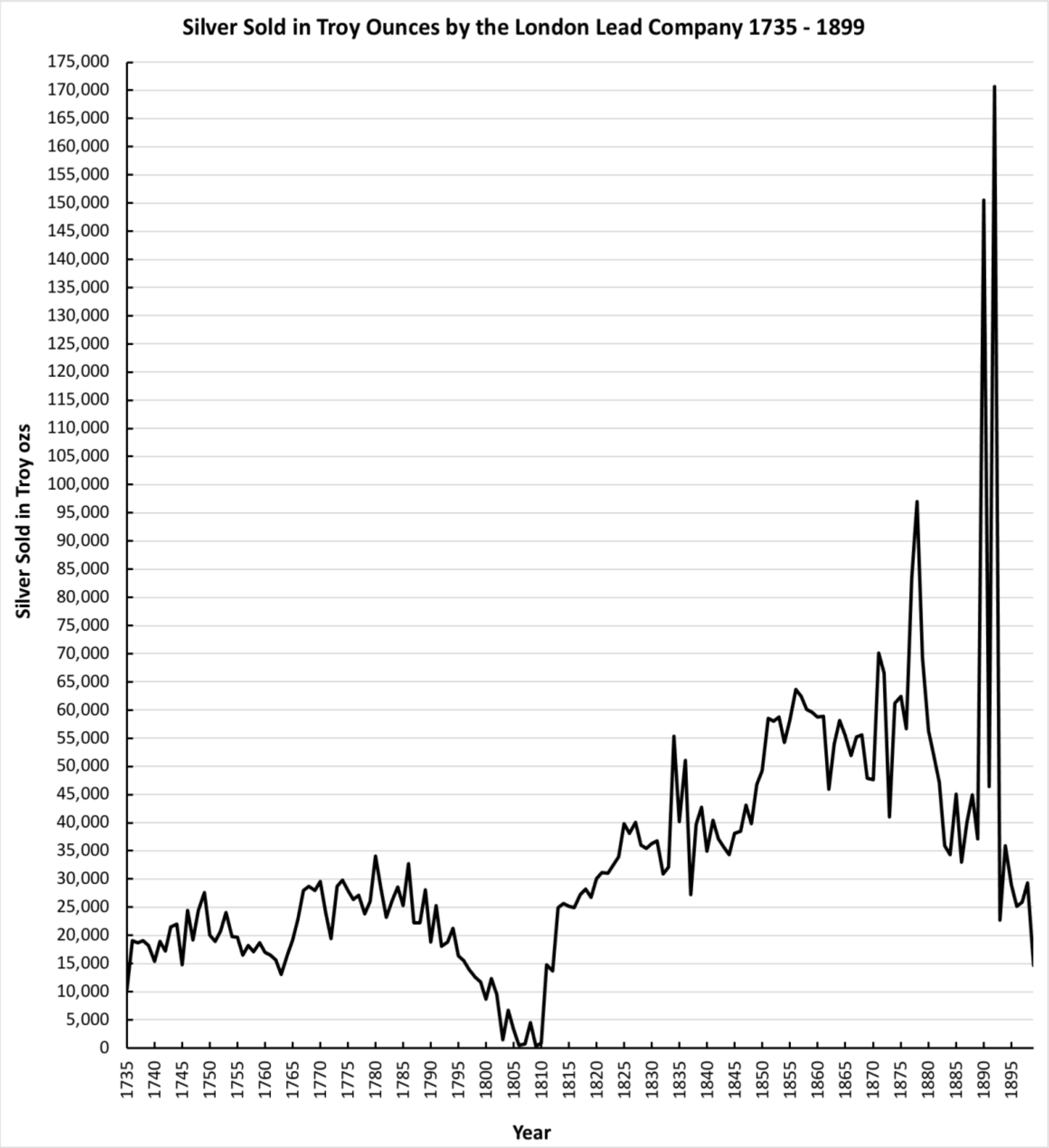
The minutes also record the company's response:

"The Court are of opinion the Charter doth not oblige them to send their silver to the mint and besides while the coinage price of 5s 2d per ounce is so much under the market price it would be a manifest loss to the company. And the solicitor of the Mint having called again at the office the secretary showed him the charter, after reading of which the solicitor said he saw nothing therein that obliged the company to send their silver to the Mint."

After this time there are no records of silver being sent to the mint.

Year	Ounces	£	Year	Ounces	£
1705	4483	1158	1713	15207	3928
1706	7738	1999	1714	8744	2259
1707	11443	2956	1715	38639	9974
1708	12634	3263	1716	11063	2858
1709	12050	3113	1717	20412	5273
1710	14404	3721	1718	19210	4962
1711	8601	2222	1719	17737	4582
1712	18786	4853	1720	29241	7554

Ounces of Silver sold by the London Lead Company



Unfortunately the records of the London Lead Company were virtually all destroyed. The minute books are still available, but they do not contain a complete set of records of the silver and lead production, and sales records are incomplete. As far as the silver records are concerned, with the exception of 1900 to 1902 there is sufficient detail to calculate the sales of silver, but accurate records of lead sales can only be calculated from 1781 up until 1901. The figures for the first sixteen years of the company show a steady increase in the amount of silver sold to the mint, which in this period amounted to over 260,000 ounces of silver valued at over £67,000. What is particularly significant is that the silver from the company was of a particularly fine quality. In 1706 for example Ingot number seven sent to the mint weighed 60 lbs. 6oz, but because of its high quality the company was allowed an extra 4lb 8oz, which gave them an extra income of £14 9s 4d.

DEVELOPMENT OF THE COMPANY AND METHODS OF PRODUCTION

The high quality silver was largely due to the improved methods of smelting and refining introduced by Dr. Edward Wright. As previously stated he had been experimenting with different methods of smelting ore and had introduced the Reverberatory furnace at Gadlis, this proved to be much more efficient than the previously used ore hearths. The Reverberatory furnace is a method in which the fuel is not in direct contact with the ore but heats it by a flame blown over it from another chamber. The heat passes over the hearth, in which the ore is placed, and then reverberates back. The roof is arched, with the highest point over the firebox. It slopes downwards to a bridge of flues that deflect the flame, so it reverberates. The process is continuous: ore is put in through openings in the roof; the slag (wastes) which rises to the top, overflows at one end; while the lead is tapped from the lowest point.

The silver was obtained from the lead by a process called Cupellation. The lead was heated, and by exposure to a blast of hot air the lead is oxidised. The basic principle was that Litharge melts at a lower temperature than silver, so careful regulation of the heat was essential. The blast of air converted the lead into Litharge (PbO) which flowed in a molten state from the surface, or was absorbed by the Cupel or furnace hearth. The silver was not oxidised and remained on the hearth at the end of the process. The desilverised lead was recovered from the Litharge by re- heating. The Litharge itself was valuable because it was used in the production of glass, enamels, and paint, and was sold at a higher price than refined lead. In 1832 the minutes of 19th April record:[3]

"Sold Walker Parker & Co 4000 pieces of refined lead at £12 5s fother, and 8000 common at £11 15s fother, and 2000 pieces of slag lead at £11 5s fother.
Sold Maltby & Co 5000 pieces of lead one thirds refined at £12 5s fother, two third common (including 1/10 slag lead) at £11 15s fother. And also 1000 pieces of slag lead at £11 5s fother.
Sold to James Horne 100 casks of litharge at £12 15s ton."

The company found that what was extremely important was the quality of the Cupel or test. For this process they used bone ash. This refining process not only gave silver, but the removal of silver from the lead makes it more valuable. Lead containing silver is harder and more brittle, but with the silver removed it becomes more malleable, so more suitable for turning into sheets or pipes.

This method still resulted in a large loss of lead in the processing. Abraham Watson in his report dated 30 May 1729 (Court minutes of 17 June 1729) to the Court gives in detail the productivity and the costs of smelting and refining in the Northern mines.[4] These figures show that only 57.5% of the weight of ore was produced as lead, and after refining this figure dropped to 51.25%.

“Shildon ore being of different sorts commonly 20 cwt of ore yields from 10 to 12 cwt of lead and silver from 16 to 18 ounces per Tun.
Jeffrey’s Groves ore 20 cwt yields from 11 to 14 cwt of lead from 16 to 22 ounces and some near 26 ounces per Tun.
“Wanlock Head ore 20 cwt yields from 11 to 13 cwt of lead which holds silver from 9 to 13 ounces per Tun.
“Blagill ore 20 cwt yields from 12 to 13 cwt of leads and holds in silver from 8 to 9 ounces per Tun.
“Tynegreen & Covertfold much the same to that.
“Clargill lead ore is poor to lead and yields silver upwards of 34 ounces per Tun.”

Shildon 20 cwt of ore to 11 cwt 2 qtrs. of lead	*£*	*s*	*d*
Loss in refining 1cwt 1 qtr.			
Remains 10 cwt 1qtr @ 13s 6d per cwt	*6*	*18*	*4½*
Silver 91/2 ounces worth 5s 8d per ounce	*2*	*13*	*10*
	9	*12*	*2½*
Charge of smelting and refining		*10*	*6*
	9	*1*	*8½*
Cost of 20 cwt of ore	*8*	*15*	*0*
Profit		*6*	*8½*

Blagill 20 cwt of ore to 11 cwt of lead	*£*	*s*	*d*
Loss in refining 1cwt.			
Remains 10 cwt @ 13s 3d per cwt	*6*	*12*	*6*
Silver 4 ounces worth 5s 8d per ounce	*1*	*2*	*8*
	7	*15*	*2*
Charge of smelting and refining		*11*	*6*
	7	*3*	*8*
Cost of 20 cwt of ore	*6*	*5*	*0*
Profit		*18*	*8*

(Although the mint only paid 5s 2d per ounce for silver, due to its high quality the company silver was valued at a higher price, for which they received additional payment)

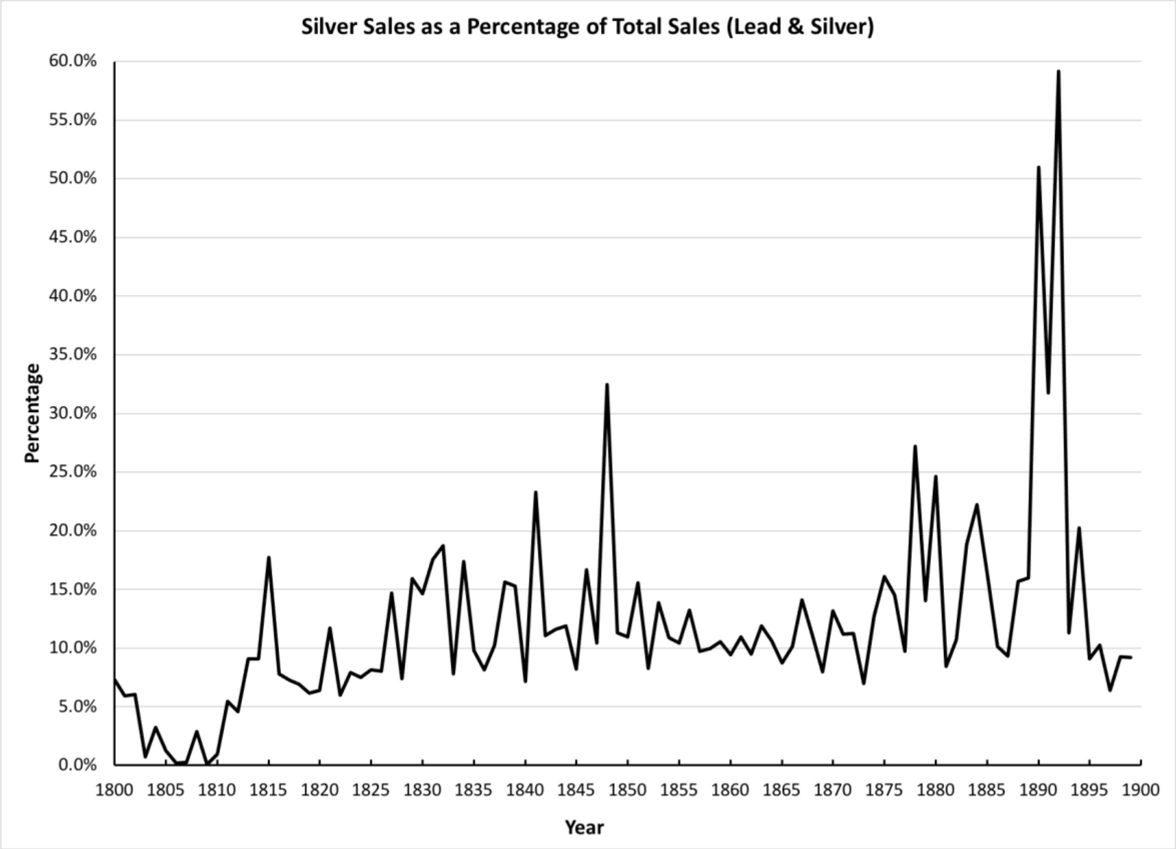
The minutes of 3 August 1708 which record the report of a visit to Wales clearly shows the importance that the company placed on experimentation to obtain the best results.

"The fumes of the lead that hang in the chimneys of the smelting and refining furnaces is converted into a sort of slagg, which is not doubted will run well in a slagg hearth so that there non remains but one waste viz. the bottom of the Test, to find a way to gain some lead from, which we hope may be done, in the mean time we save all in order to it.

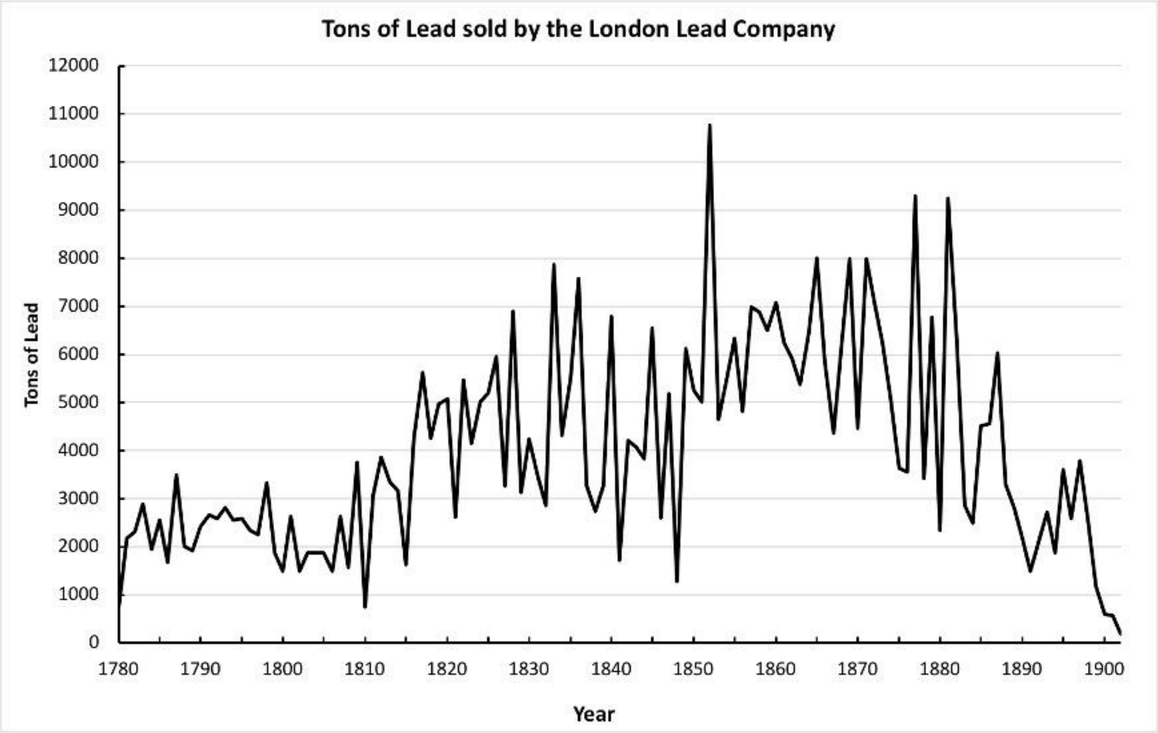
"We found at the Cupula about 30 Tunn of very good bones which cost about 30s per Tunn delivered there from Ireland and from whence they can have greater quantity from time to time which considered we thought greatly for the Company's interest, to make their own ashes upon the spot, which hitherto they could not do by trials made to burn them the last of which was by kiln, which instead of burning them to their binding quality, partly vitrified them, by the excess of their own fire fiercely drawn by the air of the furnace by which they lost their binding quality, and could hardly be pounded.

"To remedy which we tried several degrees and manners of Calcining them, and found that a reverberating oven much like that for making Red lead would effect it, by which the bones will be equally and fitly calcin'd, easily beaten, and the Calx of a strong binding quality, this occasioned us to order a small apartment to be built, that may cost about £15, where the bones will be burnt picked and beaten with little cost, and tis conceived by William Sharp that the new ashes are best by far, also in the oven the old ashes may receive a gentle Calcination almost without charge, which may add new strength to them.

"We observed that in burning the bones, they do not lose half their weight and tis found by experience, that the finer the ashes are sifted the better they bind; and that the finest hair sieves are fittest for it, of which William Sharp desires some bottoms to be sent from hence without their rims."[5]



By July 1710 the deputation who had returned from Wales reported that a new refining house had been added to Gadlis works since their last visit, holding 6 refining furnaces. Other additions for burning, stamping, grinding and sifting of Bone ashes were so good that about a Ton of ashes per week were being made at half the price they formerly cost the company.



The process of producing silver by cupellation continued virtually unchanged until Hugh Lee Pattinson invented his process for producing silver while working for the Beaumont company at Blaydon (County Durham, at the Ryton refinery). The London Lead Company minutes of 2 November 1837 record that they had paid Hugh Lee Pattinson £1,050 for the use of his patent. Robert Stagg modified this process in order to reduce the number of men needed. In 1875 the minutes of 13 July record:

"The draft of the licence from Messrs. Cookson's to use their patent for desilverising lead was laid before the Court and approved."

The method that the company wished to obtain a license to use was the Rozan process. This process used steam to stir the liquid lead rather than using men.

The letter books of the Blackett/Beaumont Company give an insight into some of the difficulties that Pattinson had in developing his process. The following are extracts from letters to Messrs. Finlay Hodgson & Co. London, from the company's agent.[6]

Newcastle 9th March 1833

"... I have declined selling more lead in large quantities until we can more fully ascertain what Common lead will be produced by Mr Pattinson's new system. I saw it

in operation yesterday and have no doubts of its success. It will greatly improve the quality of our Common lead and we expect make it available for the best description of White lead. ...”

Newcastle 27 April 1833

“... Mr Pattinson as might be expected has met with more difficulties than he anticipated in his new process. He has made but 150 pieces this week consequently I cannot send Mr Key a keel before next Saturday. ...”

Newcastle 16 July 1833

“... The piece of Silver, which has been returned, was made at Blaydon under Mr Pattinson’s immediate inspection. I have drawn his attention to the circumstances and trust it will not again occur. This is the second piece from that Refinery which has turned out impure since his appointment, and the only Silver we have had any serious complaint about.”

Pattinson had found that when lead was heated in pots and kept at a critical temperature, part of the melted lead crystallised. This crystallised lead was found to contain less silver than the original lead. On the removal of this crystallised lead you would be left with a more silver rich lead in the pot. A description of the process can be found in the report of the Children’s Employment Commission of 1842.[7]

“There were three large pots of cast iron built into brick along the middle of the room. We may call them pots No. 1, No. 2, and No. 3. Near No. 1 was a small pot, and there was another small pot near No. 3.

“The lead is melted in pot No. 1, and a man stands on one side with an iron rod and stirs the metal, and every now and then he strikes off the lead which adheres to his rod with a great hammer. On the other side is a man with an iron rod, at the end of which is a great ladle full of holes. He dips it into the pot of melted lead No. 1, and pressing the rod on the edge of the pot as a fulcrum, he raises up his ladle, which appears nearly full of lead, curled, crisping, and frosted, and from the holes in his ladle runs out a clear liquid metal. The workman holds his ladle above the surface, and shakes it until no more liquid metal will run out, and then he empties out the lead in his ladle into pot No. 2. He dips his ladle into the little pot, which has lead in it and is kept very hot, and thereby melts the lead, which had adhered to his ladle. He keeps repeating this operation until there be very little liquid metal left in pot No. 1.

“If there be a breeze of wind through the room the lead cools faster, and the work goes on more rapidly.

“The metal left in pot No. 1 is brought into moulds and cast into pigs.

“The lead which was put in pot No. 2 is melted, and is treated in exactly the same way as the lead in pot No. 1, as now described. The lead taken away is put into pot No. 3.

“The lead in pot No. 3 is melted, and treated in the very same way again.

“The lead will now contain so little silver that it would not defray the expense to melt it a fourth time.”

The report does point out that in mines where the lead is very rich in silver, more pots may be used, so allowing a greater number of separations. Under the old system, all the lead had to undergo Cupellation, with the result that a great quantity of lead could be lost. But under Pattinson's system only the silver rich lead need undergo Cupellation. The report states that by this process, of four tons of lead only twelve-hundredweight needs to be made into Litharge rather than all of it as before.

This meant a great reduction in expense of fuel and time, as well as allowing lead ore with a low percentage of silver content to be economically refined. Following the adoption of this process the sales of silver by the Lead Company increased very slightly, but the most important factor was that production was now more economic.

Year	**Ounces**	**£**
1731	6480	1674
1732	10951	2829
1733	6159	1591
1734	No Record found	
1735	10363	2677
1736	18999	4908
1737	18685	4827
1738	19037	4918
1739	18182	4697
1740	15391	3976
1741	18983	4904

Ounces of silver sold by the Lead Company

The importance that the company placed on their sales of silver can be seen from the minutes of 7 June 1720[8] in which is stated that a greater quantity of silver might be produced yearly if, *"... the joint stock of this corporation were augmented..."* It was decided to divide the present 1,270 shares into 5,080, and to reduce the price of buying the shares as well as increasing the number of shares by 1,920. At £20 per share this would increase the capital of the Company so making a total of 7,000 shares. On 20 July 1720, it was further decided to increase the number of shares by 3,000 to 10,000.

In the early years of the company, the price of silver was fixed at 5s 2d per ounce by the mint, so any variation in sales could not be to do with this price. It was only in 1744 that they began to sell their silver to individuals at the market price.

However it could be thought that when the company began to sell its silver on the open market and being able to choose when to sell, they may wait until the prices were more favourable. This does not appear to be the case, as the correlation coefficient for the relationship between the quantity of silver sold and price is -0.197 (for the period 1735 – 1899). This then suggests that the price had little or no influence on the quantity of silver the company sold.

The sale of lead would also be thought to have been influenced by the price per ton, after all it would be logical to assume that the Lead Company would want to sell at the highest price that they could obtain. However as with silver the correlation between lead sales and lead price was small, being only 0.176. Fortunately the records of the London Lead Company and the Blackett/Beaumont Company do give some clues as to what were the influences on sales.

Probably the most important factor in the company's growth is their readiness to seek out new sources of lead and silver, as well as purchasing smelt mills. The minutes of 23 July 1706[9] record the deputation's visit to Whitfield mill (Whitfield in Northumberland).

"We proceeded to Alston Moor, all on horseback (the way being unaccessible for a coach) and in our way viewed Whitfield mill, a place that has been much used for smelting lead in hearths, by help of water, it being proposed by Thomas Pattinson that for the convenience of smelting slag as being nearer the ore, it might be for the Company's interest to take it, the rent being but £7 or £8 annually.

"The following estimate being made of it Viz.

	£	*s*	*d*
5 Bings of ore (which may yield about one fodder of lead) may be carried to Whitfield for	*0*	*13*	*4*
The fodder of lead carried to Blaydon or Ryton	*0*	*13*	*4*
	1	*6*	*8*
5 Bings of ore carried to Ryton	*1*	*15*	*0*
So that there will be saved in the carrying it to Whitfield	*0*	*8*	*4*
The coals may be dearer at Whitfield than Ryton for the smelting so much ore	*0*	*1*	*4*
So that a fodder of lead may be worked cheaper at Whitfield than at Ryton by	*0*	*7*	*0*

So that we think it worth further consideration.

"There is a stream large enough and (they say) constant, tis in a bottom surrounded with very high hills.

"There is room enough for an erection and would be readily encouraged by Esquire Whitfield the landlord. But before any agreed matter should be laid out in buildings, the certainty of coals must be duly enquired into though (upon what enquiry we could make) we were assured that there was no danger of their failing, nor would they be dearer (or but very little) than at Ryton."

The Company took the lease of Whitfield mill, which was dated to begin in May 1706 for 99 years from Matthew Whitfield, the yearly rent to be £6 10s paid in equal portions on Martinmas and Ladyday. It included permission to build *"Kilns, Bingsteads, Slagheaps &c. and to make or build what is needed for smelting."*[10]

Having taken a lease of Whitfield mill the company sold their works at Ryton to the Blackett Company. The exact date of this sale is unknown but the last record in the Lead Company minutes referring to Ryton was a one dated 20 July 1708:

"The pay bill of Ryton Cupola had been examined and some errors found".[11]

Before this time there had been regular references to the pay bills at Ryton.

In July 1707 the company took a lease of Priorsdale (land south of Nenthead in Cumberland) from Thomas Richardson, and in August 1707 the company approached the Duke of Queensbury in order to take a lease of his mines in Nithesdale (Wanlock Head Scotland). The Company seal was attached to the lease on 9 September 1709 (Actual lease date 1st August 1710, for 31 years). The minutes of 13 June 1721[12] show the decision to part with a quarter of their interests at Wanlock Head. *"Resolved. That the Company on their part shall transfer to Robert Wightman and James Douglas one other fourth part of the mines at Wanlock Head (except the mill and works for smelting and refining now in the possession of the Company or which they shall erect possess or enjoy there or elsewhere with all the tools and stock there unto belonging) and the Company become subject and liable in equal proportion to all the conditions and obligation the said Robert Wightman and James Douglas are bound by their contract with the Duke of Queensbury, particularly to the obligation of rendering one sixth part instead of a seventh part in the name of farm or Tack duty."*

The Company retained an interest in these mines until 1755, when on 3 July 1755 they agreed to Alexander Telfer taking over the works.

They also had taken a lease for the Orkney and Shetland Islands in 1709, but despite carrying out exploratory work and sending samples for assay, they did not work these leases.

Expansion continued in Wales with the building of a new Refining house at Gadlis in 1710, which housed six refining furnaces, as well as increasing the number of leases. In 1714 they took a lease in Prestatyn in Flintshire. Another area of growth occurred in Derbyshire, which the minutes of 13 September 1720 record.[13]

"The treasurer reported that he had executed a writing of agreement with George Greaves dated the 6th September 1720."[14]

"George Greaves having a brother who received the dues for the Duke of Rutland of most of the mines in Derbyshire and who knows the most valuable works there and the customs and manner of taking ground, has given him orders to take at 3 several places 100 meers at each place at the forefields of good old works and enter them in the Bar Masters Books which give sufficient Title and will cost but 12d per meer entering."

The Company received a grant (for mines in Derbyshire) from the Barmaster; John Baddley dated 3rd April 1722[15].

The company found that they required a Smelting house in Derbyshire so they took a lease in 1734 on Bowers Mill in Ashover in the County of Derby about 5 miles from Winster.

Leases were also taken on the Alva silver mines in Scotland (Lease dated 21 October 1723) from Sir John Areskine. Also the Irish Silver mines in County Tipperary, this being reported to the Court on 11 May 1725[16].

"...The lease for the Silver mine at Kilboy in the County of Tipperary in Ireland had been executed. That two sixteenth was owned by Richard Champion of Bristol, two sixteenth by James Griffiths of Swansea, and one sixteenth to Edward Fenn of Cork, which makes five sixteenth the Company owning eleven sixteenth. The seal of the Corporation was attached to the assignment."

Other leases taken by the company included the mines of Blanchland in Northumberland (1727), and Swaledale in Yorkshire 1733, and it is on record that the company paid Hugh Marriot £2,625 for the mines at Grinton in Yorkshire, including a Smelting house.

This expansion of the company is reflected in the increased quantity of silver sold. In 1707, 11,443 ounces were sold, and by 1715 this had grown to 38,639 ounces. The table shows clearly the rise and fall in silver production.

Year	Troy Ounces
1705 - 1710	62,752
1711 - 1715	89,977
1716 - 1720	97,663
1721 – 1725	91,240
1726 - 1730	46,593

Number of Troy ounces of silver sold[17]

The company was doing quite well up until Christmas of 1725. Profits of the Welsh mines and Gadlis Cupola were:[18]

Period Midsummer	1724	to	Christmas 1724	£6,331	12s	6d
Period Christmas	1724	to	Christmas 1725	£9,944	0s	8d

However for the period Christmas 1725 to Christmas 1726 the amount was greatly reduced to £6,539 4s 5d. These figures for the whole year were only slightly larger than the half-yearly profit for Midsummer to Christmas 1724. This reduction in profits in 1726 can be partially explained by the large expense on Dead work.[19]

Year	Bargains by the Yard	Day wages
1726	£1260	£650
1725	£850	£560
1724	£650	£180

It can be seen from these figures that the escalation of these costs accounted for the decline in mining profit in Wales.

Despite the difficulties the Company had encountered and the heavy financial expenditure, they had been paying dividends of 40s per share from 1710 until 1724, except for 1720 when the payment was 25s. From 1725 until 1729 these payments were reduced to 30s per year.

The Company's desire to maintain the appearance of profitability is shown by the minutes of 1 July 1729.[20]

"The Court on considering the report made by several of this Company who lately went to view the Company's work in Wales entered in the minutes of the 17th June last and likewise Mr Barker's account since of Maeslugen, Trelogan and their other works which tho they do not at present, together with the workhouses and other works in the North, render profits sufficient to continue the usual dividend, yet there being good reason to hope by the benefit of the windmill ordered to be set up on Trelogan work and success at Maeslugan the Company affairs may in a short time be in a much better state and considering that any lowering of the dividend this time may affect the

Company credit with their Landlords with whom several of the Company's leases now required to be renewed. Therefore the Court thinks it best to continue the usual dividend of 15/- per share for the last half year ending at Midsummer last."

This over extension by the Company was eventually addressed in 1731 when a new Court of assistants was elected. Their opinion of the previous management is expressed in the minutes of 20 May 1731 and 13 April 1732.[21]

20 May 1731. "The present Governor and almost all the assistants being but lately elected unto that station (Therefore can be no ways chargeable with anything formerly transacted) are much concerned that the management of your affairs here to fore has not been so much for the company's interest and advantage as could have been wished. ..."

13 April 1732. "... We are sensible that it might have been much to the company's advantage to have purchased in any considerable quantity of shares especially at the low price they have been brought to through the artifices of ill designing men. One of the fatal errors of the late mal administration being the enlargement of your capital by the selling of maiden shares..."

In order that the company could be put on a more financially sound basis; apart from a 5s dividend in 1733; no dividends were paid between 1731 and 1743. During the period 1743 to 1805 the dividends remained at 5s per year with only an occasional additional dividend being paid when it could be afforded.

The following sixty years are a mixture of rationalisation and growth: in 1740 after experiencing a great deal of expense, with little reward they quit the mines in Ireland; in 1755 they left Wanlock Head; and 1777 saw the decision to leave Derbyshire. On the other hand in 1745 the company began their development of Nenthead and the Alston Moor mines, taking more leases in Durham and in 1753 took what was subsequently to prove be a major step, that of taking mines in Teesdale.[22]

23rd August 1753 "Affixed the Company's seal to a counterpart of a lease of mines called Newbiggin or Newbiggin Hope being a parcel of the manor of Bulbeck in the County of Durham from George Baker Esq. for sixteen years from the 24th June 1753."

They also in 1771 took the lease of Egglestone mills and mines and in 1805 plans were made to replace Acton Mill with Stanhope mill.

"That Stanhope mill was equally well situated for the Company as Acton mill, it has now 2 blast hearths a reducing hearth and a refinery and that there is room by either enlarging the present building or running up a new building to erect an air furnace which will render it equal in power to Acton mill say 327 Bings per month and a horizontal chimney if thought necessary may be."

The next major decision made by the company was to leave Wales. The minutes of 8 April 1790, reported that over the past nine years Gadlis and the Welsh mines (Including the Isle of Man) had lost £9,099 5s 4d, whereas in the same period the mines of Alston Moor had made a profit of £9,306 4s 9d. It was also stated that only 63 tons of ore had been produced the previous year. On 15 April 1790 the decision was made that the Welsh concerns should be closed. It was not until 1792 that this closure was achieved. The Isle of Man leases were sold to the Duke of Athol for £1,250, and the company's leases of mine called Perthyaen near Prestatyn and smelt works at Bagilt near Holywell, Flintshire, were sold at auction to John Griffiths for £700. The result of the loss of their works in Wales corresponds to a drop in the sales of lead and silver, 36,794 ounces of silver and 2,354 tons of lead sold in 1781, compared to 14,720 ounces of silver and 2,2640 tons of lead sold in 1795. The drop in silver sales is probably significant, but the drop in lead sales is not, and as we shall see there were other factors at play, which could have caused these changes.

In the early years of the company the source of the silver that was sent to the mint or other buyers was recorded in the minutes, from this information it is possible to calculate the percentage of silver coming from Wales that was sold by them.

Year	Percentage	Year	Percentage
1705	69.3	1765	27
1745	42	1775	16
1755	22	1785	18

Percentage of silver sold, coming from Wales

THE DEVELOPMENT LONG LEVELS

The move from sinking shafts from the surface in order to work a vein, to the use of long levels was one of the major contributors to increased production. The earlier methods were very labour intensive requiring extensive use of Gins or Jack Rolls to remove the ore and waste materials out of the mine, as well as to drain them.

It is probable that the earliest long levels in the North of England were the Coalcleugh adit in West Allendale, and the Haugh Main adit at Allenheads, which were begun in 1684 by Sir Walter Blackett.[23] These levels were initially made sufficiently large to admit a man, being only 4 to 5 feet high, 2 feet wide at the top and 15 to 18 inches at the bottom (Coffin Levels). Such long levels involved a great deal of "Dead Work" which produced no financial return, so this great expense could only be undertaken by large companies. With the widening of these levels large enough to admit horses, and the introduction of rails, was said by Thomas Sopwith to have been introduced by Sir Walter Blackett around 1740 - 1760. Originally wooden rails were used, these were later strengthened with iron strips along the running surface, and later iron rails were used. Robert Stagg in his Midsummer report to the Court informed them that he had put iron rails in Lodgesyke in Teesdale, Middlehope in Weardale and Rampgill mine in Alston Moor. By 1859 they had over 68 miles of iron rails in their mines.

Perhaps the two most well-known long levels were the Nentforce level and the Blackett level. The Nentforce level was started on the 10th June 1776 for the Greenwich Hospital by Richard Walton and John Smeaton. Its purpose being to drain the mines of Alston Moor and discover new veins, and was around 5 miles in length. The Blackett level was started in 1855 for the Beaumont company by their agent Thomas Sopwith. The adit entrance is in the bank of the East Allen below the town of Allenheads. When work stopped on this level in 1905 it was 4.7 miles long, and Whintings vein, Esp vein and St Peter's veins were discovered. Esp and St Peter's veins were the most productive.

The construction of the levels relied heavily on timber and stone. Tinniswood Millican the district agent for the London Lead Company in 1862 reported to the Kinnaird Commission that the miners were supplied with free timber, and it was left up to the men when this should be used although the manager may insist that they use more if he thinks it necessary. He also informed them that using stone was cheaper and longer lasting than wood, around 10s a fathom cheaper. Not only did the Lead Company use stone for arches but also after 1827 all Drawing levels, shafts and sumps were lined with stone. It is also interesting to note that the use of stemples were frowned upon, ladders being preferred.

Robert Bainbridge when asked about the desirability of stempling replied:

"... Those stemplings are very apt to rot at the ends that go into the rock, and the might break almost without the knowledge of the parties that they were so near the point of breaking. ... I consider it an objectionable mode of ascending and descending a mine, and such as we do not at all adopt in our present mines."

He went on to explain that they used ladders with flat wooden staves tenoned into the sides, that each ladder was around 10 feet long resting on a staging called a landing.

Robert Bainbridge gave the following information to the Commission.

The Lead Company's Mines, Nenthead

Cost per fathom of timbering the mines

	£	s	d
To 9 pieces of larch timber 6 feet long, each containing 11/2 cubic feet, at 1s. 6d per foot		*16*	*10½*
To 12 pieces of larch timber 6 feet long, each containing 3 superficial feet, at 11/2d per foot		*4*	*6*
To carriage of timber from wood yard to the mines, 47 feet at 11/2d per foot		*1*	*11½*
To carriage of timber into the mines, 6 wagons, at 4d per wagon	*2*	*0*	
To fixing timber, 2 days, at 3s per day		*6*	*0*
To filling and drawing work produced in fixing timber, 3 wagons, at 8d per wagon		*2*	*0*
Total Cost per Fathom	***1***	***13***	***4***

Cost per fathom of arching the mines

	£	s	d
To winning and leading stones to the mines, fathom at 8s per fathom		*8*	*0*
To taking stones into the mines, 6 wagons at 4d per wagon		*2*	*0*
To walling and arching levels 1 fathom at 11s per fathom		*11*	*0*
To filling and drawing work produced in fixing arch, 3 wagons at 8d per wagon		*2*	*0*
Total cost per Fathom	***1***	***3***	***0***

The problems of not maintaining the levels or not continuing with dead work and trials was expressed by Robert Stagg in his report of Midsummer 1816[24]. He is highly critical of Thomas Dodd the previous agent, who had not maintained the levels, so they had not kept up with the workings. He had done this in order to keep costs down and to simply raise the maximum amount of ore possible. It was essential for any company that trials should be continued for lead; as if they did not the mines would soon become unproductive. Even if demand at that time was not high it was essential for the long-term prosperity of a company to find the reserves of ore which would be needed to meet demand when it arose.

Successful exploration or lack of it can be a major influence on the amount of lead produced and therefore available for sale, so continuing to make trials was essential.

The quantity of lead produced and sold by the company in the period 1816-1850 is given below.[25]

	Ore sold in Tons	Ore Raised in Tons
1816	4274.9	5365.2
1817	5616.3	6712.4
1818	4258.0	7484.4
1819	4964.3	6999.2
1820	5081.5	8118.8
1821	2614.4	7934.4
1822	5471.5	8217.6
1823	4142.2	9707.2
1824	5020.8	12074.4
1825	5189.3	12146.0
1826	5951.3	11791.2
1827	3274.3	11686.4
1828	6896.9	11889.6
1829	3136.5	10035.2
1830	4235.1	10404.8
1831	3472.5	8288.4
1832	2861.6	7017.6
1833	7870.3	6552.8
1834	4314.2	7219.6
1835	5503.6	8097.6
1836	7578.0	7258.0
1837	3264.3	6949.6
1838	2745.7	7066.8
1839	3276.1	7061.2
1840	6793.7	6600.4
1841	1718.7	6776.8
1842	4203.3	6171.2
1843	4076.4	7372.8
1844	3832.9	7367.6
1845	6305.3	6793.2
1846	2413.5	6884.0
1847	5043.4	6670.8
1848	1270.4	7491.2
1849	6062.5	8563.6
1850	5256.6	9656.0

DRAINAGE OF MINES.

The problems of drainage have already been mentioned, and in deep levels was a particular problem, as the water had to be pumped out. The decline of the Company's works in Wales and Derbyshire, were largely due to this problem. In 1730 their Maeslygan mine was 105 yards deep and prone to flooding, which was exacerbated by their neighbours, miners from Derbyshire, allowing water from their mine drain into Maeslygan, which resulted in its temporary closure. The problem was resolved when the Lead Company and the Derbyshire miners agreed to share the cost of a 'Fire Engine with a 36 inch cylinder' to pump the water away. The cost of this flooding is described in a minute dated 20 May 1731.[26]

"In Wales we are at present agreed with the Derbyshire gentlemen who work a mine at Pentre adjoining to ours of Maeslygen and in consequence of that agreement we are actually at work to draw the water to come at the ore which we have hitherto been successful the water having fallen between 30 and 40 yards which about three fourths of the whole. And though the labour at present is expensive it will we are well assured, by the judgement of all our agents sufficiently recompense our charge, hoping in a little

time to be raising ore there. This work has cost upwards of ten thousand pounds and for these two years past has lain unwrought as to profit upon account of a difference with the above mentioned gentlemen"

This minute goes on to describe a similar problem of flooding at their Trelogan mine.

"Your mine at Trelogan which has produced formerly a large quantity of ore is at present drowned with the great increase of water that is come into it, at this mine you have had a low level carrying up for some years past which will not be finished under two or three years more. But it is reputed one of the greatest works in Britain, we were unwilling to stand still so long and have therefore agreed for a fire engine to be erected at that place which is now actually preparing for draining that mine, that we may partake of visible riches thereof."

In order to supply these pumping engines with coal as well as supplying their works at Gadlis, the company took a coal mine near the River Dee about half a mile from Gadlis. The cost of a pumping engine with a 33 inch diameter cylinder was reported in the minutes of 3 October 1733 to be £700.

The company used such engines throughout their works and were constantly trying new machines in order to improve the productivity of their mines. In Alston Moor hydraulic engines were used. Wallace suggests that the first hydraulic pumping engine on Alston Moor was erected in Rampgill mine in 1767, the Court minutes of 3rd September 1767[27] record:

"a present of 25 Guineas given to William Westgarth for his new constructed water engine at Rampgill mine." Another, at a later date, was placed at the bottom of the engine shaft, to pump water from Scaleburn vein, in the Great Limestone, and from the works made to prove Rampgill vein in strata below the Great Limestone. Engines had already been installed in Coalcleugh mine where William Westgarth was agent (for the Blackett Company). John Smeaton in a letter dated the 29th April 1769[28] says:

"I had the pleasure of seeing the first machine of this kind at work, for draining or unwatering a Lead mine, belonging to Sir Walter Blackett, at Coalcleugh, aforesaid, in the summer of this year 1765; since which time that machine has been shown to all those who had the curiosity to see it. He has now erected four others in different mines in that neighbourhood, one of which I have seen, and all attended with equal success..."

VENTILATION

The ventilation of the mines was of great importance, as if the miners could not work efficiently due to lack of air, production would be reduced. The problem of ventilation increases the further you are from the level mouth; Jacob Crawhall reported to the Mitchell Commission[29] that:

"... Sometimes there is foul air sets into the mine; sometimes when we are driving far from the air course, and are obliged to do it, the air comes in, which puts the candle out, and we are obliged to leave. Not many are suffocated by it, only very few.

"It is not proper to stop after the candle goes out. Sometimes we must hang the candle half perpendicular that the grease may flow down to the flame of the candle, and burn in spite of the foul air. ... We have most foul air when the weather is dull and the

clouds hang low; in clear dry weather it is much better. When the foul air is breathed, it breaks a person's wind. It is very seldom that men stop in so long as to fall down and need to be carried out."

This change in atmospheric pressure greatly affected the quality of the air in the mines; temperature had little effect on air circulation, as the temperature tends to remain constant throughout the mine.

Mines were ventilated by means of connecting shafts, some of which would go to the surface, or by running a second level from the air into the hill and making communication, via shafts to the other levels, so providing a circulation of air. This is unusual rather than the norm, running another level or sinking shafts involves a great deal of expenditure, and the mines may not be worth it. There were artificial methods of ventilating a mine, one such involving the use of furnaces to heat the air and cause a circulation of air.

Joseph Cain reporting to the Kinnaird Commission of 1864 described the result of erecting a furnace at Burtree Pasture mine for ventilation, *" ... It has only been lighted four or five days, and so far the result is very beneficial."* This system had already been in use in Allenheads and had been found to be very effective in ventilating the mines. Trap doors were also used to direct the air to those places which it was most needed. A door still to be seen in Smallcleugh mine could well be an example of this method. In other areas especially the extremities of the mines, it was necessary to pump air along pipes for the miners to be able to work. This piping was initially made of wood, but later of metal: John Millican's journal of 28th March 1817 records:

"The Rampgill Mines and Smallcleugh are going on about as usual. We have got the machine placed and are putting up the Cast Metal air Pipes in the Capelcleugh Cross Vein Level, which will we expect supply these workmen with good air for a long time."[30]

The most common method of supplying air was the use of a water-blast. Robert Bainbridge describes the methods used by the London Lead Company to the Kinnaird Commission.

"They force in fresh air, pure atmospheric air, into the fore ends, where the men are working. I mean forcing in the air where we are driving a level, by a water blast or a fan blast. Sometimes it is worked by men (Fan Blast) and sometimes by waterpower. If we are driving a long level, our object is to get a water blast down a shaft, or from the inclination of the hill, which we are generally able to do from the springs, bringing them down in close pipes, and so get 15 or 20 fathoms of pressure, as we find it convenient, and then the escape of that water through an opening in the bottom, into a pipe at the end, forces the air forward a great distance."

Despite these improved methods of ventilation, the workmen still had to breath bad air, Robert Bainbridge admitted to the commission that men still suffered from bad air but he felt that it was the dust and gunpowder smoke that had the greatest effect on the miners' health.

Windy Billy (Fan Blast) Nenthead Mines

DRESSING THE ORE

Early methods of dressing the ore were very basic and labour intensive, ore being cleaned and separated from impurities by the use of a Buddle, a channel which would slope gently, usually made of wood. The material to be separated would be placed at the highest point and a stream of water would pass over it carrying off the lighter particles, leaving behind the lead ore. Buddles became more and more sophisticated as time passed. The large pieces of Galena would be removed to the Bingsteads. The mixed rock and ore were broken up by hand using a Bucker (flat headed iron hammer) and knockstone (stone anvil), after which the material would be separated. Those pieces that could not be separated by hand were sieved using a hand sieve (very similar to a garden sieve). This sieve being held in a tub of water and shaken so that the materials were separated into layers. It was the modernisation of these methods that improved the productivity and economy of the mines.

Thomas Sopwith[31] describes an improvement introduced at the Nenthead works. In 1796 Richard Trathen introduced Stamp Mills, which used waterpower to crush the ore, much more quickly than could be done by hand. He also introduced slime pits, these were positioned below the Buddles and caught the fine ore that otherwise would be normally lost.

Richard Trathen is mentioned in the accounts for Rampgill, Scaleburn, and Smallcleugh mines for the period September 1798 to September 1799.[32]

Richard Trathen ore stamp mill cutting Scaleburn mines	*9 Bing 6 cwtat 36/- bing*	*£17*	*11s*	*0d*
Richard Trathen ore stamp mill cutting Smallcleugh mines	*72 Bing 0 cwt at 36/-bing*	*£165*	*12s*	*0d*
Richard Trathen & pts ore per Ton	*5 Bing 4 cwt at 30/-*	*£8*	*5s*	*0d*
Richard Trathen & pts Balance of lead		*£0*	*10s*	*2d*
Richard Trathen & pts allowed for 21 shovels		*£2*	*2s*	*0d*
Total earned		*£194*	*0s*	*2d*

In the following year he was paid £356 10s 4d for 121.1 Bings of ore.

In 1808: the Lead Company moved a Crushing machine from Garrigill to Middlehope, the agent Thomas Dodd commenting that, "experience has proven that nothing is so beneficial to lead mines as crushing machines."

He went on to say in his following report of 31 October 1808:[33]

"The Crushing machine is finished (at Middlehope) and will be of great use to the mine, on the calculating of the Bargains now before the Court I reduced all the principle ones 3/- per Bing on account of the benefit of the machine, and besides it may be fairly considered that the machine will make 1/7th more ore than the common mode of washing, in the poorest and most stubborn part of the ore; and therefore don't hesitate to say that the crushing machines are amongst the improvements recently made in lead mining."

The Company eventually had these machines at all their major works, with various modifications.

Other changes included mechanising the Buddles and the introduction of Jiggers (also to become mechanised). Jiggers (or Hotchers) were introduced in the 1820's. These were a sieve inside a wooden box, around five feet in length in which was suspended a sieve attached to a pole. The box would be about three-quarters full of water, and the material to be separated would be placed on the sieve which could then be moved up and down in the water by means of the pole. This repeated movement separated the light material from the heavy, which could then be removed. A major change that was brought about was the total reorganisation of the dressing floors. Each partnership had employed a group of boys/men to wash their ore for them, but this proved to be very disorganised, and often inefficient, as the ability and reliability of the washers would vary. The report of Thomas Dodd dated 1 November 1811, informs the Court that the miners came out of the mines to assist the washers, and in his report of 18 January 1812 he stated that the partnership working Irishopeburn mine *"...employ not less than 10 men and lads to wash the ore, having so much rubbish in it, it requires many hands to make it clean".*

Robert Stagg remodelled the company washing floors in 1818 and it most likely that it was at this time the company took responsibility for the washing of the ore and put the washers on wages. The mining partnerships were charged by the company, for this to be done, the charge depending on the quantity and quality of the bouse brought out of the mine. In 1849 further efficiencies were made when a Mr Attwood**,** who worked at Nenthead, invented a slime trunking machine. This machine was designed to sieve out the finest particles of lead from the mud from the crushing machines (Slimes). It was a box into which slimes (the finest mud from the crushing machines) and water were delivered and mixed by revolving blades, and then the material was screened by a curved perforated plate. The waste was carried away by launder; the slime washed, and from there was taken to a settling tank.[34]

It was not only mechanical apparatus that could affect the production of ore as we see by a minute dated 28th March 1865.

"The Governor brought to the attention of the Proprietors that the year ending 31st October 1864 had been satisfactory but which would have been more successful had not the unusual drought of the last summer checked their washing operations and stopped the completion of the Dressing of the whole of the ore raised within the year."

LEASES

The system of obtaining mine leases involved obtaining a lease of a specific length and width, and involved the company in promising to employ a specific number of men on each lease. If the company did not employ the specified number of men the lease could be withdrawn. This system of lease lengths worked well for individual veins, but caused a great deal of trouble, and extra cost, if a company was working a group of adjacent veins. This was the case for the London Lead Company, who were working a large number of veins. Robert Stagg in his Lady Day report of 1819[35] states:

"The Millstone that weighs down the profits of this District is the almost endless leases we are forced to maintain and the equally endless extent of levels that have to be upheld; which necessarily create an unavoidable and great expenditure at all times but which is peculiarly felt when the mines happen to become poor. In every instance of mining leases of Greenwich Hospital, I have contended for an extension of boundary. I have thus already succeeded in greatly curtailing the number of leases of the hospital with a view to further curtailments in the renewal of several leases, which are now expiring. I do not much expect that they will grant all the indulgence in this way that I have solicited, but I have reason to hope that they will be induced to trade two or three leases into one in each case where there are several leases of lengths in the same vein."

Also in his report for Christmas 1819:

"The mines there are by no means in a flourishing state and the almost endless levels that have to be upheld and kept in repair added to the immense extent of Dead work that must constantly be prosecuted to maintain the numerous leases create an unavoidable charge on this Department which renders it next to impossible whilst we hold the whole of these mines on the existing terms to render this district sufficiently profitable. I shall therefore be prepared to submit to the next deputation, the propriety of whether declining to work a proportion of the mines that are considered least promising, or to require of the Hospital more liberal terms."

These difficulties were appreciated by Edward Hawke Locker, who in his report to the Hospital in 1823[36] made the following points:

" ... Some changes in the Terms of the Leases may be made with advantage to both parties, which would go far to prevent the neglect of any Veins or Beds of Ore

which may not be duly explored at present, ... The occupation of the Mines under Lease, by Persons who can command a considerable Capital, is highly important, and has been conspicuously shown by the great benefit which the hospital has derived from the London Lead Company, who have been its Lessees for seventy eight years. During this period, that very respectable body has enjoyed very large profits from the concern; and in these the Hospital has liberally participated without any risk whatever. Most of the important improvements in Mining have been introduced by them. Their levels at Nenthead extend nearly twenty miles underground, and are still carrying on with great spirit, although for some years past they have been greatly surpassed in profit by others of your lessees, who have not made equal exertions. I learn from good authority, that their expenses last year, considerably exceeded their receipts, and that on average of the last twenty years, their profits from the whole of our mines, have borne no proportion to the very large capital they have expended; but their important gains upon mines in other districts, have enabled them to prosecute a speculation so little profitable to themselves, and so advantageous to the Hospital. To this company, therefore, it is both just as well as politic to afford every encouragement, without which it cannot be expected they should continue these great exertions. Mining property is an adventure subject to great fluctuations; and in times of difficulty, it is only by men of capital, that the mines can be kept open, and the income of the Hospital preserved. Not many years have elapsed, since this was strikingly exemplified in Alderstone Moor. The price of lead, towards the close of the war, fell rapidly from £40 to £16 per Ton. In consequence of this failure of the market, the humbler adventurers here threw up their mines, and a great number of the workmen fell upon the parish. Many emigrated, and those who remained were involved in great distress. In this emergency the London Lead Company steadily continued the working of their mines at a heavy loss; and but for this, the parish of Alderstone must have been involved in one common ruin, being utterly incapable of supporting any further burden. The Company has pursued the same uniform course; while they have very judiciously discouraged high wages in times of prosperity, they have proved the great support of the labouring people in the period of difficulty, not proportioning the rate of wages to their miners, by the standard of the Lead market, but by the price of provisions.

"The Board has now under consideration an application from this Company for a General Grant of the Mines which they at present hold under separate leases from the Hospital. They desire to be freed from many of the present restrictions, as to the employment of their men, and the prosecution of improvements, and I strongly recommend that there request may be granted, because it is only by such means that mines can be worked upon an extensive scale."

In 1823 following this report the Lead Company managed to obtain a change in the lease system, they obtained a general grant covering the area in which it was active. The grant was split into two areas; Nenthead in which it was to employ at least 100 pickmen; and Garrigill in which it was to employ at least 40[37].

Despite these changes to the leases in the 1830's the Company had great difficulty as the price of lead obtained fell from £17 per Fother to £13 10s per Fother. During the latter years of the Company they obtained changes to the leases with the hope that these would enable them to function more profitably. The minutes of 19th August 1879 record that they had *"received a letter from the Lord's Commissioners of the*

Admiralty of the 15th inst. stating that they agree to a reduction of the Royalty payable to them as trustees of Greenwich Hospital viz. for lead ore from one twelfth and for the minerals, from the scale at present in force to one eighteenth for two years certain from 1 July last. Also to allow a reduction of the number of pickmen to one half of that required under the terms of the lease".

In 1884 the Company obtained a change in the terms of their leases in the Teesdale district, as the minutes of 17th June record:

"The Duke of Cleveland agrees to forego payment of all Royalties absolutely for the two terms commencing on the 1st instant and expiring at the end of the second term in February next on the following conditions."

"1st. That the Company employ not less than 30 men during that time in exploration and Dead work, the manner and locality in which such men are to be employed being arranged between Mr. Scarth and the Company's Superintendent."
"2nd. That not more than 220 men the present number be employed in raising ore."
"3rd. The reducing scale of Dues recommended by Mr. Foster is to be paid from the last settlement to the 1st June instant."
"4th. That the Company pay the fees of the engineer and accountants called in by the Duke of Cleveland to investigate the accounts, such amounts not to exceed £250."

LABOUR COSTS

One of the major expenses for any company was the cost of labour, and its most economic use. In Midsummer 1817[38] Stagg informed the Court that he was proposing a change in the way the bargains were to be set and the distribution of the men in the mines. He was conducting an experiment to ascertain whether it may not be, *"more advantageous in some parts of the vein to cut the whole of it by the fathom rather than the bing."* Both systems continued to be used but by 1864 it was reported by Robert Bainbridge to the Kinnaird Commission that three quarters of the company's mines were now paid by the fathom.

In times of hardship for the workmen, due to the high costs of food, the company would supply the men with cheap corn. This served the purpose of the company not having to increase wages, and their reputation of being good employers would be enhanced.[39]

John Millican the Alston District Agent, in his journal of 7th March 1817 records:

"A supply of Oat Meal has this day been delivered to the workmen, which is a most seasonable relief, and all that can be done; on account of the dearness of the times they are many of them almost in a state of starvation."

On 21st March 1817: *"This has been a very busy day delivering Oat Meal to the workmen, at the conclusion of this days delivery (this being the last of the present month) it appears the consumption is about 72 Alstone Bushels or 108 Bolls".*[40]

In 1793, due to the decline in the price of lead and high cost of labour which was reducing their profit, (which also reduced the amount of money available for exploration) the Court wanted to reduce the amount paid to their workers, but this gave them some concern, as they were worried that a hard winter would create difficulty for their men; this is expressed in the minutes of 7 November 1793.[41]

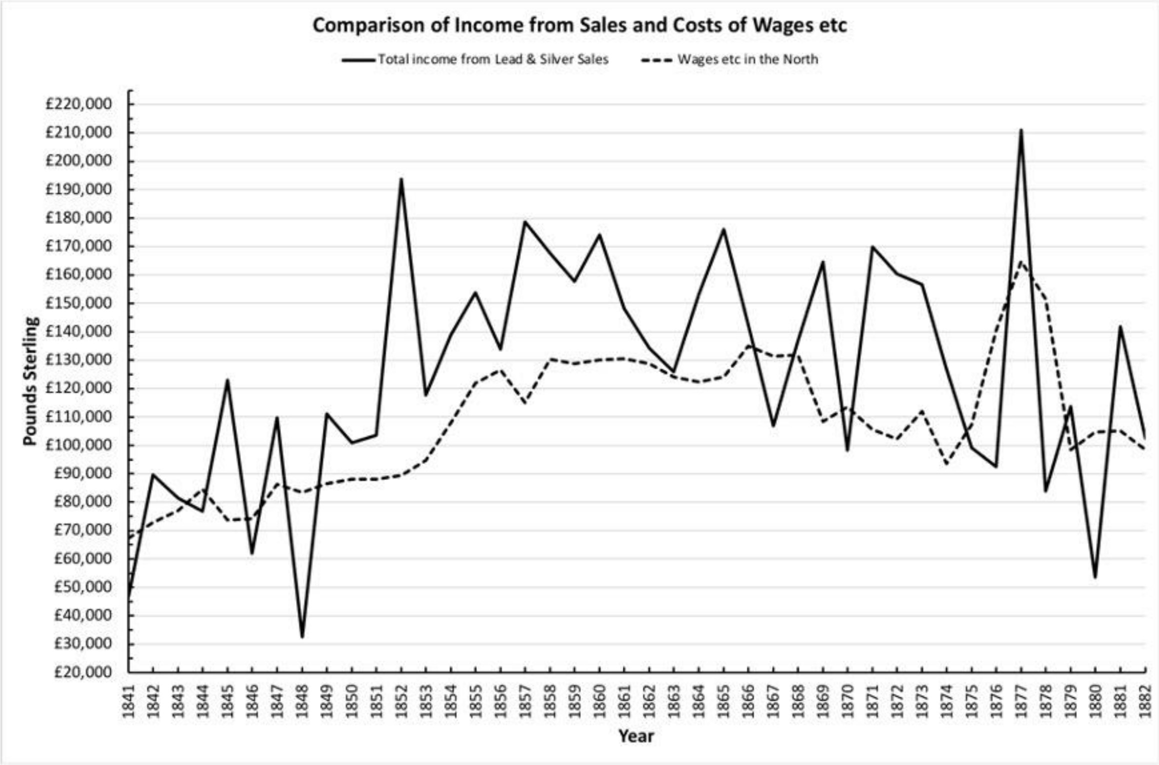
"Thomas Dodd has had some consideration at the fallen state of the lead market by lowering the bargains since Ladyday 1793 about 3s per Bing, he has not nearly reduced the bargains to the same as they were in the years 1785 and 1786, when lead sold at the same prices nearly as this year £16 10s.

"It may be justly observed by the Court that this ought to be done, but we fear that there will be some difficulty in accomplishing that object, though it is the duty of the Court to attempt it, but it is worth considering whether the Company's should strain it a shade upon the eve of perhaps a severe winter. We recommend the Court to acquaint their Agent Thomas Dodd of the above statement and bargains let in the year 1785 and 1786 ordering him at the same time to lower them as near as possible to the present state of the lead market, to make himself acquainted and inform the Court at what price Blackett's and other considerable mining adventurers in the county let their bargains at this time."

It was also the case that when food prices declined so did the rate paid to the miners as is made clear in Robert Stagg's Michaelmas 1817[42] report:

"As there is every reason to calculate upon grain being at moderate prices during the winter I have ventured to make a further reduction of 1s a week on all the wagemen's rates. I have also made an additional reduction in the bargain rates."

Examination of the General Index Book and the Court Minutes for the period 1841 to 1899 (This is the only period during which these records are given) shows that there is a correlation of 0.78 between the money spent on wages and costs incurred in the North, and the recorded income of the company from sales of lead and silver.



The relationship between the level of profitability and wages was one that the Company was constantly monitoring, in 1864 they put down the increase in profits as being due to a reduction in wages, as the minutes of 31st March 1864 explain:

"The Proprietors will observe that a considerable portion of the increased profits arise from a reduction in the amount of the wages earned by the miners as compared with the previous year. Under the most careful management it is difficult to keep the wages of the miners exactly to the proposed scale; and this forms one of the many uncertain elements in mining risks."

The Half Yearly General Court Minutes of 27th March 1866, record, the continued stagnation of the lead trade and increased cost of wages in the North:[43]

"In our last years report, while congratulating our Proprietors on the satisfactory condition of the Company's mining prospects we called their attention to the extreme stagnation in the demand for lead. This stagnation continued for some months causing our stock, particularly of the Common qualities to accumulate to a considerable extent, and when at length the demand sprung up, prices ruled considerably lower than in 1864 and we were forced to clear off a large quantity of Common lead at prices that barely paid the cost of production. The produce of the mines has been quite as favourable as we anticipated, but the low price at which we disposed of our accumulated stock materially affected our average of sales and consequently the net profits of the year. … We must not however close our report without drawing the special attention of the shareholders to the serious increase our expenditure in the shape of wages. It is of the great difficulties we shall have to contend with, and one over which we can have no certain control so long as the competition for labour prevails in the North."

The Court minutes refer to having to reduce the cost of labour on a number of occasions:

12th November 1878.
It was resolved that the basis of wages for underground men be reduced to 16/- per week at the next Bargains.[44]

9th September 1884.
Mr. Bainbridge was instructed on the termination of the existing bargains, to reduce the underground and surface expenditure for labour, stores and materials at the mines to the value of the ores raised, taking such value at £2 10s per Bing and that all ore Bargains be discontinued that will not yield a profit taking the ore at 45/- per Bing.[45]

It is interesting to note that despite the need to reduce wage costs the company continued to assist their miners as is seen in the Court minutes of 1887:[46]

18th January 1887
The Court having laid before them the statement of the advances to the workmen and the losses thereby incurred see with some surprise that there has been a constantly accruing loss on these advances, independently of the balance left in abeyance under the old system. The Court trust that prompt steps will be taken to reduce the future advances within such limits as will protect the Company against any essential loss.

8th March 1887
And that the amount of advance balances still remaining due from the workmen to the Company be cancelled and that the Superintendent be instructed to make no further claim in respect of them.

29th March 1887
Mr Bainbridge stated that he had been requested by a deputation of the miners to convey to the Court their grateful thanks for their generous concession made them in cancelling the old outstanding "Advance balances"

IMPROVEMENTS IN SMELTING

The methods of smelting and refining lead have already been mentioned, but it was not until 1788 that the company decided that the Reverberatory furnace should be used throughout their various mills. This followed an experiment carried out by Robert Stagg at Egglestone Mill, comparing the blast hearth to the reverberatory furnace (air furnace).

The minutes of 11 December 1788[47] state:

"The Court having taken into consideration the experimental operations by Robert Stagg of the Air Furnace in competition with the Blast Hearth are of opinion that it will be for the interest of this Company to make use of Air Furnaces.

"Resolved that Air Furnaces be erected throughout the Company's works as soon as conveniently may be."

Further improvements were made when Thomas Dodd was directed by the Court of 18 April 1793:

"...To erect at Nenthead two Refinery's agreeable to the plan he proposed."

An important part of the smelting process was the roasting of the ore. This was carried out in a reverberatory furnace, the purpose being to remove the sulphur from the ore, and to cause the ore that is in the form of dust to adhere together, so that it is not blown out of the Reverberatory furnace. On the 12 September 1811 on the advice of Robert Stagg, the Court decided that a roasting furnace should be built at Nenthead, and further modifications were carried out when on 10th May 1864 the Superintendent was authorised to construct a double roasting furnace at Nenthead mill.

It had been realised very early that lead and silver were being lost from the mills as silver and lead left the furnaces in an evaporated form, up mill chimneys. In the early years some chimneys were built with a 'kink" in them in the hope of condense this material. The most successful method was to construct a horizontal chimney, ending in a vertical chimney. These were built from the mill running up the hillside. At Nenthead this was approximately 1,100 yards, whereas the flues from the Allen smelt mill run for over 4,000 yards. The Lead Company agents Robert Stagg and Thomas Dodd received the instruction to build horizontal chimneys at all the company's mills on 30 November 1802. These flues had the advantage of not only condensing lead and silver (called flume) which could be cleaned off and smelted, but also it removed the dangerous fumes emitted by the mills from the valleys and inhabitation. The fumes from the smelt mill caused problems to the health of those near it, as was the case with all mills.

Dr Peacock reported (1864)[48] that:

“I was told that at Nenthead the exit chimney of the smelt mill was formerly situated at about 800 yards from the furnaces, and in a somewhat lower situation, and at the time the residents in a group of cottages near the chimney suffered from symptoms of dyspepsia, with a tendency to colic.”

Dr Mitchell[49] in his report of 1842, commented that:

“... In the case of the London Lead Company the smelting mills at their Nenthead station are near a public road, and when the wind carries the smoke upon the road, as from the prevalence of south westerly winds in this country it must be the case about three parts of the year out of four, it is most offensive to travellers, and in a populous district would not be endured for half an hour.

*“Since the chimney was placed at a further distance o*f 400 yards, and in a more elevated and exposed situation this has entirely ceased.”

Joseph Stagg the son of Robert Stagg, who was Nenthead Mill Manager, took out a patent on a condenser (in 1843), that was designed to clean the smoke and obtain from it, the lead products, by forcing the smoke through water using powerful pumps powered by a water wheel. The minutes of 5 September 1844[50] record this:

“The Superintendent be allowed to present Mr J D Stagg (after he has left his situation under the Company) with a gratuity of Two hundred pounds in consideration of his past services; also to acquaint him that the Court cancel their claim upon him for reimbursement of his expenses that have been incurred in taking out his patents for his Flume Condenser.

“The Superintendent be instructed to proceed immediately with the maturing plans and estimates for the construction of a water dam in Priorsdale and for the erection of a Flume Condenser at Nenthead and to submit the same to the Court.”

He was ordered to divide the cost of these over a period of years at a rate of £1,000 a year.

We have already seen that in the early years the amount of metallic lead obtained could be quite low, in 1817 there had only been a small improvement.

Statement of the Cost of Lead per Fother when delivered at Stella which is raised in the pickings at 50s per Bing.[51]

	£	s	d
Cost of raising 5 Bings of Ore (which exclusive of Duty will produce one Fother of Lead) at 50s per Bing	*12*	*10*	*0*
Wood used in raising the 5 Bings of ore computation say at very most		*10*	*0*
Carriage of 4 Bings to the Mill say 3s per Bing		*12*	*0*
Smelting per Fother being the average cost	*1*	*0*	*9*
Lead Carriage per Fother on the average say	*1*	*1*	*0*
	15	*3*	*9*
Deduct gain by Refining on the average say on a moderate computation	*1*	*5*	*0*
which leaves as the total cost when delivered to Stella	*14*	*8*	*9*

From this we see that 5 bings of ore or 40 cwt to produce 1 fother of 21 cwt, therefore they were only expecting to recover 52.5% of Metallic lead from the ore.

However the productivity did improve greatly, and in 1881 the percentage of recovered metal had risen to 75.7% in 1865 as the table below shows.[52]

RECOVERY OF LEAD FROM LEAD CONCENTRATES

	Year	**Tons of lead Concentrates**	**Tons of lead Metal**	**Percentage Recovery**
London Lead Co.	1845	10537	7053	66.9
London Lead Co.	1855	8626	6328	73.3
London Lead Co.	1865	8979	6801	75.7
London Lead Co.	1881	6535	4848	74.7

The improved methods of production, changes in the labour force, and related economies that were made, do not adequately explain the fluctuations in the sale of lead, and silver. It is therefore apparent that external forces rather than merely changes within the company must be responsible. When looking at imports and exports of lead a number of interesting relationships can be seen. For example the correlation coefficient for the relationship of Lead price and the amount of lead exported by Britain between 1850 and 1903 was -0.57, and for the same period the correlation coefficient for the relationship between lead price and the quantity of lead imported into Britain was -0.81. Yet for the periods 1822 to 1903, the correlation coefficients were a lot lower, the relationship of Lead price and the amount of lead exported by Britain was -0.29, and the correlation coefficient for the relationship between lead price and the quantity of lead imported into Britain was -0.39. It is evident then that imports and exports and any factors affecting them need to be examined.

THE EFFECTS OF WAR

The effect of war on trade could be great. Joseph Richmond in his letters to Sir Walter Blackett[53], expressing his concern about the lead trade shows this.

18 February 1755 "... Lead is fallen at Stockton and Hull and there are great quantities at these markets. I should be glad to know whether war is expected in Europe this summer, that I may regulate my conducting the lead trade accordingly; for if we should have a war the first market that offers will be the best but I hope an open rupture will not happen this year. ..."

21 October 1758 "... The price of lead is now dropped to £13 5s and even at this price I cant' get a quantity sold. The lead you have at market cost you £12 per fother when the mines and mills are paid so that little or nothing can be expected from the lead trade this year and I wish it may not be worse next year for the quantities at all markets are so large that I fear the price will continue to fall till we have peace. We have nothing materially stirring at present."

The coastal routes, especially the important East Coast routes, could be cut off by enemy action, the cost of insurance increased and thus forcing the merchants to abandon their normal sailings. If they did sail they would try to use the periodic escorted convoys. In September 1706 the Lead Company asked the Admiralty for a convoy so that they could transport their lead, as at the time Britain was at war with Spain and France (The war of Spanish Succession).

The Newcastle Courant of 29 May 1779 gives an excellent account of the difficulties caused by war[54].

"Early on Sunday morning several ships sailed from Shields, and had not got above two miles from the bar when a French Frigate of 22, a Snow of 16, and two cutters of 10 and 12 guns came out of the sea and attacked them, and took the Jenny Petrie, with goods for London, and ransomed her for 1,500 guineas, the Brighthelmstone, Bennet, with coals for London, and ransomed her for 300 guineas, the Jenny, Horsley and the Friends Goodwill, Laiton, were also taken, but are since retaken by the Queen armed ship, and sent into Shields. Three others the Lark, Providence Increase, and William and Mary are missing. This attack was so near the coast that it was seen by many people on shore; and to the credit of Sir Henry Heron of the merchant armed ship, in Shields harbour, on the first alarm got all the assistance he could procure, and was towed out against the tide in pursuit of them. Whilst the Content armed ship, a pensioner to government, lays, and has laid many months unserviceable, and yellow flagged, in this harbour, notwithstanding the many representations of her incapable situation of proceeding to sea.

"A sloop belonging to Whitby Alum works, was chased, and much peppered in both keel and rigging, but out sailed them, and got into Shields. As did a brig belonging to Scarborough, through the perseverance of the Captains wife, who, when he called to the Mate to strike the colours, desired to have a few more shot fired at them; during which the Jason frigate coming down with the Scotch convoy, and the Queen armed ship also coming in sight, the privateers made off; the Jason and Queen pursuing, the Merchant taking charge of the Scotch fleet, which she saw off St Abbs Head, and returned on Wednesday."

John Blackett, agent for Sir Thomas Blackett at Newcastle wrote on 1 June 1779[55].

"... You would see an account in the papers of the late captures made the 22nd instant within sight of Tynemouth by four French privateers, three vessels were ransomed two were taken and it is supposed they have taken three with them. We had some cruisers on the coast but they could not come up with the privateers, they will not ransom any ship that has lead which has raised the freight of that article and indeed for the present prevents any ship taking it. We sent an express to the Admiralty and have an answer that further protection will be given the trade; indeed there is a great need of it. ..."

If the lead could not be transported, then this would result in large stocks being left lying at the ports, which resulted in a drop in the prices at these ports. On the other hand, in places such as London, where there was a demand for lead that was not being met, the prices were high. This accounts for the Lead Company choosing in to transfer some of its stocks in the North to London in 1810.

If an important market was an enemy or under the control of the enemy then direct trade would be impossible. This occurred for example during the Napoleonic wars, as Britain was denied access to Europe. Not all countries would necessarily be cut off, as trade continued with Russia, India, and America. Even during a war that Britain was not involved in directly there would still be difficulties with trade, as the belligerents would blockade each other's ports, as occurred during the American civil war. One positive result was that after a war there was often a post war boom in demand, this occurred after the end of the Napoleonic wars and American civil war. In 1815, the company minutes record the sale of 1625 tons of lead whereas in 1816 they sold 4274.9 tons and in 1817, 5616.3 tons. As a general rule it could be said that a war would create a reduction in demand, but there are exceptions. Looking at the Lead Company sales there was an increase in the price they obtained for their lead in 1800, the average price obtained was £20.71 per ton. This rose to £28.91 in 1803 and peaked at £36.46 in 1805. By 1812 the average price of the lead sold by the company had fallen back to £22.59 per ton. This corresponds to an increase in the production of bricks in England and Wales, 543 million in 1800, rising to 933 million in 1807.[56] This may seem a strange relationship but both were used in the building trade (lead was used for pipes and roofing) and there was a boom in demand for buildings around this time. This increase in demand for building materials was largely due to the large amounts of money that had been spent on war materials, which resulted in near full employment, and an increase in the amount of money available within the economy.[57] It is not surprising then to find that there was also a rise in the production of white glass, used in windows of the new buildings, from 8,200 tons in 1800, to 9,900 tons in 1805, production remaining in the region of 9,000 tons until 1813 when it fell to 6,000 tons.[58] Lead was also used in paint, and changes in its production could effect the lead market. In 1809 Martin Morrison the Beaumont agent at Newcastle in writing to Mrs Beaumont complained that the high price of Linseed and Turpentine, had contributed to a reduced demand for lead[59].

During the war in the Crimea there was another peak in price, the average price rising from £17.41 per ton in 1851 to £23.11 per ton in 1857. This was probably due to strong home market, and the fact that exports to Europe and other countries were not affected. There would have also been a small increase in demand for munitions. The effect on Company sales was seen even before war was officially declared, as the minutes of 27th October 1853 show that an order for 2000 pieces of lead for St Petersburg was cancelled as they could not get a ship to transport the cargo to Russia.

IMPORT AND EXPORT TARIFFS

Wars were expensive and so governments were keen to utilise every means to pay for them, taxation on imports and exports being a major source of such money. In 1747 (Cap 14) a tax of 1s per ton of goods, was imposed on all ships entering a British harbour, that did not unload their cargo. An earlier Act had imposed a 1s per tax on exported goods. In 1779 and 1782 there were two further acts which imposed duties on the trade in lead.

"By an Act of Parliament in 1779 (Cap. 25. An Act for granting to his Majesty additional Duties upon the Produce of the several Duties under the Management of the respective Commissioners of the Customs and Excise in Great Britain.) From the 5 April 1779 a Duty of 5 per cent was to be imposed on all goods imported into, exported from, or carried coastwise in Great Britain.

"By the Act of Parliament Cap. 66. 1782; An Act for Granting to His Majesty additional Duties upon the Produce of the several Duties under the Management of the respective Commissioners of the Customs and Excise in Great Britain; an additional 5 per cent (over and above the 5 per cent raised in 1779) was to be laid upon all Goods imported into, exported from, or carried Coastwise in Great Britain."

In 1784 there was a further Act of Parliament (Cap 49) which raised the duty on exported lead from England, Ireland, and Wales, which went into effect on the 20 September 1784

"An Act for granting additional duties upon Raw and Thrown Silk imported into Great Britain, and upon Lead exported from Great Britain into parts beyond the Seas, and for allowing a drawback upon the Exportation of silks, and stuffs mixed with silk, imposed a duty of £1 1s on every Ton of lead exported."

This was as well as the Duties imposed by the Acts of 1779 and 1782. Therefore if one ton of lead were sold in this Country at £16 the export duty would be: -

Old Duty	£16 x 10%	=	£1	12s	0d
New Duty		=	£1	1s	0d
Total Duty		=	£2	13s	0d

This did not go down well with the lead producers as is expressed in John Blackett's letters to Sir Thomas Blackett.[60]

24 September 1784
"… The late duty on lead has certainly had a great effect on the price and must give the Scotch a very undue preference they being exempt from the late, as well as from the old duty on exportation."

27 February 1785
"… To make application to Parliament for a repeal of the said Tax (Duty on Lead). This certainly will be a proper measure, not only for the reasons set forth in the enclosed resolutions, but as this Tax certainly enables the proprietors of lead mines in Scotland (by being exempt from this duty) to undersell the other lead at the foreign markets and after all the tax is by no means productive. I shall endeavour to get the lead owners &c in this place to have a meeting, for the purpose above mentioned and as I am informed that you are in Town you will have opportunity of conversing with Sir M Ridley, Mr Brandling and the County members &c on the subject."

There was to be a meeting of the proprietors of lead mines in Derbyshire to take into consideration the tax on lead with the intention of having the Act repealed, Scotland was exempt from this duty by the Act of Union 1706 (Cap 8, Article 14).

On the 12 March 1801[61] the Court minutes stated that:

"Mr Maltby and Mr Ellill attended the Court but declined purchasing at present on account of the proposed duty on lead.

"The Court took into consideration the additional tax proposed to be laid on lead exported from this country."

The tax that they were concerned about was brought in, in 1803; the duties on lead had been changed by Cap. 68. *"Lead Cast or uncast the fodder or Ton quantity 20 cwt £3 10s or for every £100 of the value £6."*

This was confirmed by Cap. 98. in 1809.

Duties on Imported Lead

Lead; viz.	**Duty**	**Drawback**	**Temporary or War duty**
Black, the cwt	*£0 2s 6d*	*£0 1s 8d*	*£0 0s 10d*
ore, the Ton	*£1 2s 6d*	*£0 15s 0d*	*£0 7s 6d*
Pig, for ever £100 value	*£20 0s 0d*	*£6 13s 4d*	
Red, he cwt	*£0 5s 3d*	*£0 3s 6d*	*£0 1s 9d*
White, the cwt	*£0 6s 6d*	*£0 4s 4d*	*£0 1s 3d*

Duties on Exported lead

Lead cast or uncast, the ton	*£3 10s 0d*
Ore for every £100 of the value	*£6 0s 0d*
Litharge the cwt	*£0 0s 4d*

The war against France in 1806 had become an economic one. Napoleon, had decided that he must stop British trade if he was to win so in 1806 he declared Britain to be in a state of blockade, and that all trade with Britain was forbidden; and that any ship trading with England or carrying English goods would be taken. Britain replied in 1807, by stating that any ship trying to enter a French port or a port of her allies would be seized. This in turn led to Napoleon declaring that any ship entering a British port would be seized when it left. To enforce the blockade on France the British insisted on stopping and searching neutral ships, leading to America declaring war on Britain. This war took place mainly at sea, and in December 1814 the Treaty of Ghent ended the war. But all these sanctions had an adverse effect on British trade.

In addition to the lead companies having the war to deal with, they were coming under increasing pressure from imports of lead. John Blackett had talked about this potential difficulty in a letter of 21 October 1797[62] to Isaac Wilkinson a lead merchant:

"… A gentleman of my acquaintance, a very intelligent well informed man who has resided for some years in Spain, informs me that if the Spaniards were to open their mines of Lead? They could undersell us in this country, considerably, as their mines are very rich, and worked at a small expense. …"

This was to become steadily worse and the change in duties on lead imports that occurred in 1825 could not have helped. Colonel Beaumont's Newcastle agent wrote the following letter to the Right Honourable William Huskisson, on 25 May 1825.[63]

"Sir As agent to Colonel Beaumont (the undersigned) owner (s) and an extensive occupier (s) of lead mines I (we) have learnt with the utmost alarm in that it is intended to lower almost to nothing, the duty now payable on the importation of Foreign lead and ore. As this measure appears to me (us) fraught with injury to the lead miners and to the numerous people now usefully employed in parts of the country which admit of no other occupation, and believing it to be highly injurious to the general interests of the country, beg leave to state the grounds on which I (we) depreciate the adoption of the measure.

"The expense of making lead consists almost wholly of the amount of labour employed; the capital laid out in shafts and levels and machinery is in part only, so much labour indirectly concerned.

"It is obvious therefore that in every country the expense of obtaining ore and making lead, will bear an exact proportion to the cost of subsistence, where provisions are cheap and wages low, lead is raised at comparatively little expense everything that enhances the price of labour adds to its cost. It would then be a waste of time to prove that in a country where subsistence is raised to twice its national rate, lead cannot be made for the same expense that it is made for, in countries where provisions are cheap. So long as the price of subsistence in England did not exceed that of other countries the superiority of English skill, the greater exertion of its labourers enabled the country to supply half the continent with lead. Indeed their geographical position and the facility of water communication, under the North of France, the Netherlands, a great part of Germany and Russia the national markets of British metals. The cheapness of foreign labour compared with our own has now driven the English miner from his market abroad, and it will not long leave him that of his own country, if foreign lead is allowed to be imported at one half the present duty. Many of our mines must then be shut up and our miners driven to emigrate and their industry lost to the country.

"The events that have taken place in the few weeks that have elapsed since the measure was first agitated shows that these alarms are not without foundation. Persons who are supposed to be the agents of the Spanish Government have in two months sold 4,000 Tons of lead and intend to offer more, and there is now arrived an agent from the Emperor of Austria to sell the produce of the Imperial mines in Carinthia at prices destructive to the English miner.

"The undersigned feels that he should not have discharged his duty to his employer and to the 30,000 families whose very existence is at stake and to whom this measure will leave no alternative but the choice of banishment or the workhouse if he had not raised his voice against its adoption."

This letter had no effect and the new duties as listed below were imposed.

Import Duty

5 July 1825 Cap 104 Duties on Imported Lead

Lead; viz.

ore, the Ton	£0 10s 0d
Pig, the Ton	£2 0s 0d
Red, the cwt	£0 6s 0d
White, the cwt	£0 7s 0d

5 July 1825 Cap 111 Duties on Imported Lead

Lead; viz.

Black, the cwt	£0 4s 0d
Chromate of Lead, the lb.	£0 2s 0d
ore, the Ton	£0 10s 0d
Pig, the Ton	£2 0s 0d
Red, the cwt	£0 6s 0d
White, the cwt	£0 7s 0d

The effects of this new act can be summarised as follows: -

Before the 5 July 1825

Pig Lead £20 percent Ad valorum

Lead ore £1 16s per Ton

Since the 5 July 1825
Pig Lead £2 per Ton
Lead ore 10/- per Ton

There were further changes to the duties on imports, which finally resulted in no charge being levied.

1828 Cap 76 Duties on imported Lead
Lead ore from the 1st of December 1828 the Ton £1 5s 0d

28th August 1833 Cap 56 Duties on Imported Lead

Lead; viz.	
Black, the cwt	£0 4s 0d
Chromate of Lead, the lb.	£0 2s 0d
Ore, the Ton	£1 5s 0d
Pig, the Ton	£2 0s 0d
Red, the cwt	£0 6s 0d
White, the cwt	£0 7s 0d

4 August 1845 Cap 90 Duties on Imported Lead

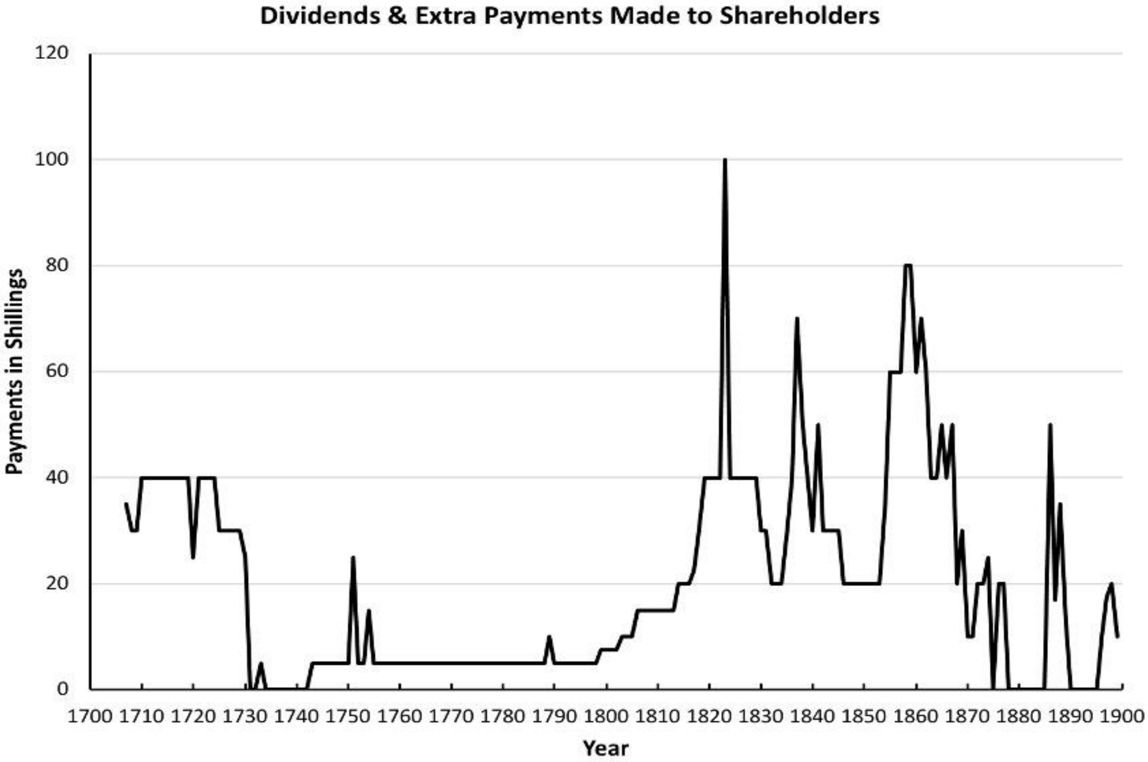
Lead; viz.	Foreign	British possession
Black, the cwt	-	
Chromate of Lead, the lb.	-	
Ore, the Ton	-	
Pig and sheet, the Ton	£1 0s 0d	£0 5s 0d
Red, the cwt	Free	Free
White, the cwt	-	

14 August 1855 Cap 97 Duties on Imported Lead

Lead; viz.	
Black, the cwt	Free
Chromate of Lead, the lb.	Free
Ore, the Ton	Free
Pig and sheet, the Ton	Free
Red, the cwt	Free
White, the cwt	Free
Litharge	Free

The reduction in 1825 of duty on lead imports did lead to an increase in the quantity of lead entering the country, from around 700 tons to 6,000 tons, but this was not sustained and fell to around 1,000 tons in the following years. The removal of duty in 1845 resulted in an increase of lead imports of over 60%, and this increase continued through to the 20th century. Between 1822 and 1849 the correlation coefficient for the relationship between imports and lead price was only 0.05, yet for the period 1850 to 1903 it was -0.76. This suggests that in the first part of the 19th century imports were not affecting prices greatly. This is borne out by the figures for tonnage of lead imported and exported by Britain, despite the concerns of the lead producers in the first part of the century lead exports greatly outnumbered imports. In 1850 lead exports were nearly double that of imports. This situation changed dramatically after this time: by 1860 imports exceeded exports by around 1,000 tons; in 1870 imports were nearly double exports; and by 1880, imports were three times greater than exports. By 1900 this had grown to six times greater.

No dividends were paid to the shareholders between 1878 and 1885, the company parting with their mines on Alston Moor, selling them in 1882 to John Cameron Swan's company the Tynedale Lead and Zinc Company.



The company concentrated on their mines in Teesdale, but with the increase in imports, the price of lead fell, and instead of being an exporter of lead Britain became an importer of lead. As production of lead in Spain, America and Australia increased, so production in Britain declined.

In November 1889 the Court authorised Mr Bolton, the manager at Egglestone mill, to buy 100 tons of Australian ore. It was to be an experiment; the ore was expected to yield 300 ounces of silver per ton.

The Court minutes[64] record the following purchases of silver lead:

26th November 1889 100 tons of Australian Silver Lead was purchased at £14 12s 6d ton

17th December 1889 Reported the purchase on the 14th inst. of about 58½ tons of Spanish silver lead at £14 1s 3d per ton for lead.

24 December 1889 Bought 58½ tons of Spanish Silver Lead at £14 3s 0d

7 January 1890 bought about 86 tons of Spanish Silver Lead at £14 3s 9d per Ton.

1st April 1890 bought 100 tons of Australian Silver Lead at £13 12s 6d per Ton.

13 May 1890 Bought 200 tons of Australian Silver Lead at £14 7s 0d per Ton.

28th April 1891 The Lead Company tender of £17 10s ton for 100 tons of silver lead ore from the Laxey Mining Co had been accepted.

26 January 1892 bought 159 tons of silver rich Australian lead.

These purchases account for the very large sales of silver made by the company in the early 1890's, without any correspondingly large sale of lead.

Year	Ounces of silver	Tons of lead
1889	37092	2800
1890	150472	2179
1891	46418	1490
1892	170634	2080
1893	22745	2726

In 1892, in order that they could purchase silver lead when it became available, the company applied to the banks to arrange credit, in February, it was reported to the Court that the bankers had agreed to open credit of £25,000, which the company could use for purchases of silver lead.

FORMATION OF CARTELS

Both the lead companies and lead merchants did at times try to influence the price of lead, but this was largely unsuccessful. The London Lead Company and the Blackett Beaumont Company were large enough to counter the attempts by the London Lead Houses, to keep prices down by either acting alone or together. John E. Blackett's letter to Sir Thomas Blackett dated 10 October 1783[65], describes such an attempt, by the London merchants.

"... I have not sold any lead since I last wrote you and really begin to be very uneasy on that account as the value of your lead at this time at Blaydon will amount to upwards of £40,000.

"I have had a great deal of conversation with Mr Hall and Mr Christopher Blackett on the subject; they decline naming a price for any quantity and say that at present there is little or no demand for lead at the London Markets. It is very plain that the London Buyers have entered into a combination and as you have much the largest stock of lead they set their mark on you and are in hopes of bringing you down to their own terms. I have acquainted Mr Hall and Mr Blackett that unless they soon make a purchase you will be under a necessity of sending up to London 15 or 20,000 pieces of lead to be disposed of by commission at that market, which would effect the London Dealers in a considerable degree.

"I hope the apprehension of this measure may induce them to make a purchase soon. ..."

A similar situation occurred in 1791, some of the lead companies considered that the low price of lead was a result of the London Lead Houses working together, and in response it had been proposed that the lead mine owner's band together to try to support the price of lead. John E. Blackett in a letter to Messrs. Ransom & CO Bankers London, dated 18 January 1791[66] refers to this.

"... Had the reduced price of lead been owing to a combination of the London buyers something might have been said in favour of this scheme but as it most certainly is occasioned by the small demand owing to the war, as well as the large quantity of lead at the several markets it is a most absurd idea. ..."

It was difficult for the Lead companies to work together as they each had their own cash flow problems. In November 1784 the Blackett Company had to reduce the price of their lead in order to make a sale, as they needed cash quickly in order to be able to pay their workmen.

It is therefore apparent that if we are looking for reasons for changes in the price of lead they cannot be attributed in any significant way to the London lead merchants or the lead companies.

One factor that did cause concern was the growth in the number of lead merchants that had set up their own refining operations. In the minutes of 30th March 1869, it is recorded that the ore raised in 1868 was 23,821 bings, being about equal to 6,600 tons of lead, they had sold 6045 tons but the prices were still low. The average of the year 1868 being £19 11s 4d a ton against £21 10s 11d in 1867 and £20 16s 6d as the medium of 5 years 1863/67. This falling off of value was blamed on the fact that the lead merchants had increased their own refining operations.

"This falling off in the value of our own produce is a very serious matter as to a certain extent it must be attributed to the fact that of the late years many of the principle lead merchants have increased their own refining operations and with the scientific improvements which have been introduced many ores are being used for the manufacture of White lead which formerly would have been rejected."[67]

The company was right to be concerned as this meant the lead merchants could import cheap foreign ore and produce their own lead, so cutting out the larger lead companies.

CONCLUSION

The quantity of lead and silver sold, and the prices obtained for it, fluctuated greatly over the companies 200 years of operations. These changes cannot be attributed to changes within the company. The modernisation of the methods of obtaining the ore and treating it certainly contributed to the company's survival and growth, but it was external influences that affected price and sales. Wars certainly affected the amount of lead sold, but due to the company's size and foresight, exploration continued so they did not cause a great reduction in production, and this being reflected in the fact that silver sales did not drop significantly during these periods of war, with the exception of 1806, 1807, 1809 and 1810. Import and export duties in the early years had very little effect; even the major reduction of import duties in 1825 only caused a temporary increase in imports.

The decline in the lead industry can be instead attributed to the increased production of lead in Spain, America, Germany, and Australia. By the 1880's these countries were producing large quantities of lead so they could not only meet their home demands for lead but were able to export as well. The lack of import duties on lead cannot have helped, but it would have taken a large tax to have affected this trade sufficiently to benefit the mine owners, and the international political situation would not permit such a tax. In 1823 William Huskisson MP for Liverpool had encouraged the government to pass a Reciprocity of Duties act. This Act enabled ministers to make mutually beneficial trade agreements with foreign countries, the purpose being to encourage the growth of British industry, which had undergone a decline after peace, had been declared in 1815. This attitude towards trade continued through the remainder of the century. Cheap imports of raw materials from other countries would help British industry to produce manufactured goods cheaply, and therefore boost exports. This was seen as a means of encouraging entrepreneurs to expand their businesses, and therefore create more employment, and it proved to be effective in doing so.

Year	Tons	cwt
1895	3349	14
1896	3775	12
1897	2858	7
1898	1924	6
1899	990	17
1900	776	6[68]
1901	743	6
1902	815	14

Ore raised by the London Lead Company in their Teesdale mines

Unfortunately, as is shown in the table, the Lead Company went into a state of decline after 1895. In 1901 they only employed 107 men and of those 37 were working to raise ore and 16 on dead work, the remainder being involved as labourers and washers.

The company were making a small profit in this period which enabled them to also pay dividends to the shareholders.[69]

22nd December 1896. The profit for the half year ending 31st October last was £4409 2s 6d.
A dividend of 7/6 per share recommended for the period ending 31st October last.

6th July 1897. The profit and loss account for the half year ending 15th May last showed a profit of £7,024 14s 1d.
A dividend of 10/- per share was recommended.

29th December 1897. For the half year ending 30th October last a profit of £6,563 6s 2d was shown.
A dividend of 10/- per share was recommended.

1st July 1898. The half year ending 14th May last shows a profit of £4,642 15s 7d.
A dividend of 10/- per share was approved.

The audit of the accounts of the company for the period 13th May 1898 to 31st October 1898 shows:

"After writing off the sum of £399 for depreciation of plant the profit and loss account for the period shows a profit of £2,020 4s 7d.
The stocks of Ore Lead and Stores etc. have been taken and certified by your officials. The Ore and Lead Stocks have been valued at the price at which the stocks at 31st October last were taken into the accounts, the sales having absorbed the whole of the produce during the period."[70]
A dividend of 5s was recommended.

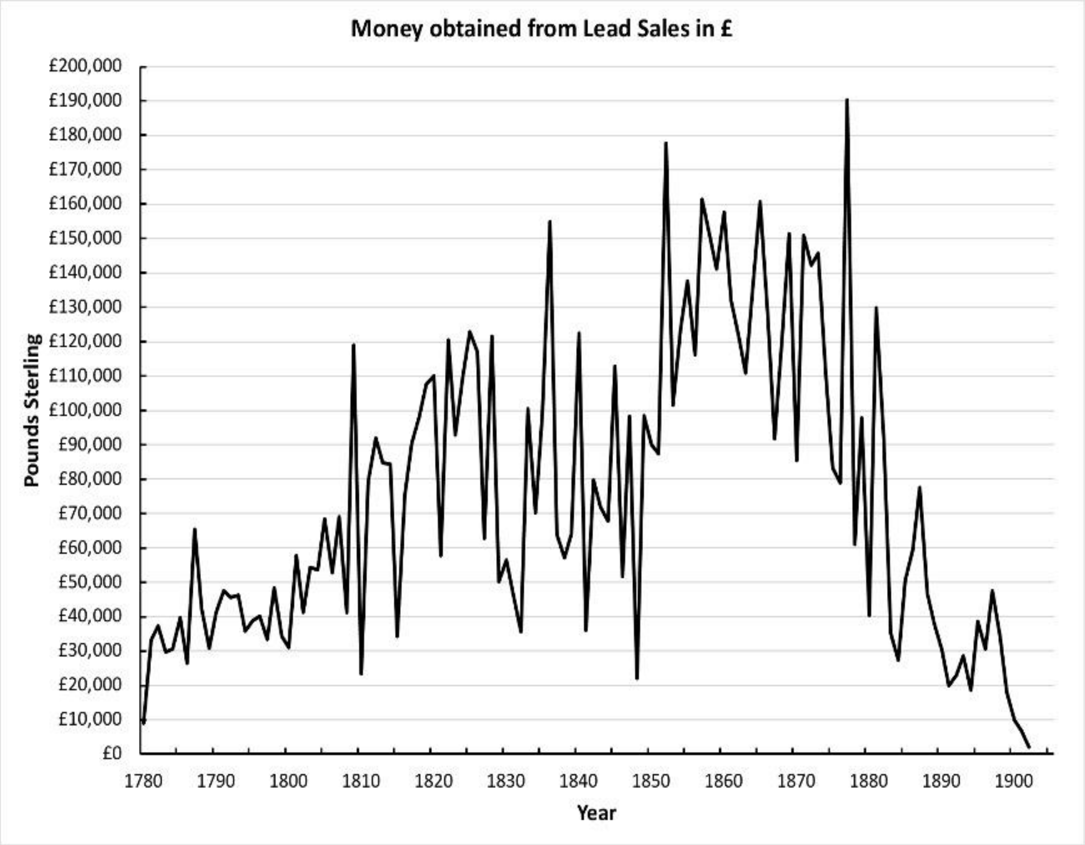
James Hyslop (Bailiff to Raby Estate) in a letter dated 4 August 1902 wrote:
"... I am sorry to say the mining prospects in Teesdale are at present at very low ebb. The London Lead Company, who as you are aware, has been carrying on operations for so many years have given their leases up, and will cease to work at the end of next October..."[71]

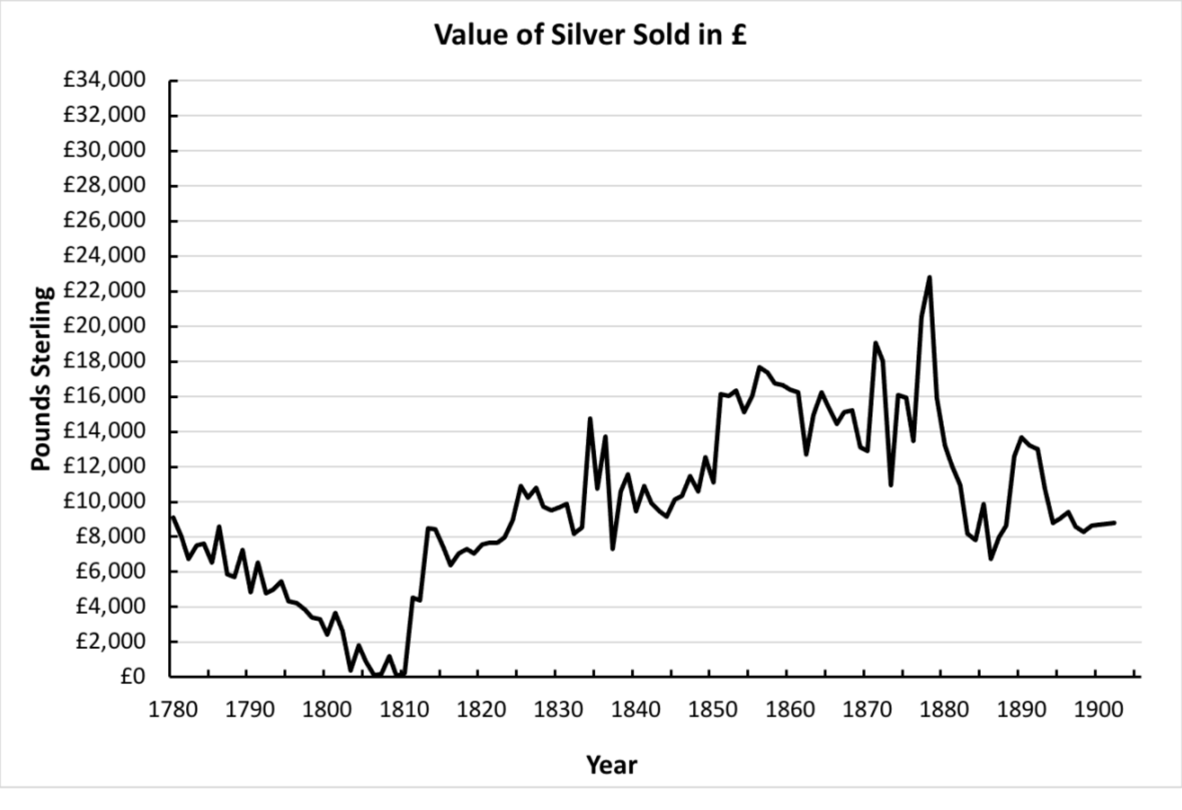
In September of 1902 the company were dismantling their works at Coldberry and Lady Rake mines, selling the iron from these places at £2 10s per ton. In this way the company ended 200 years of mining.

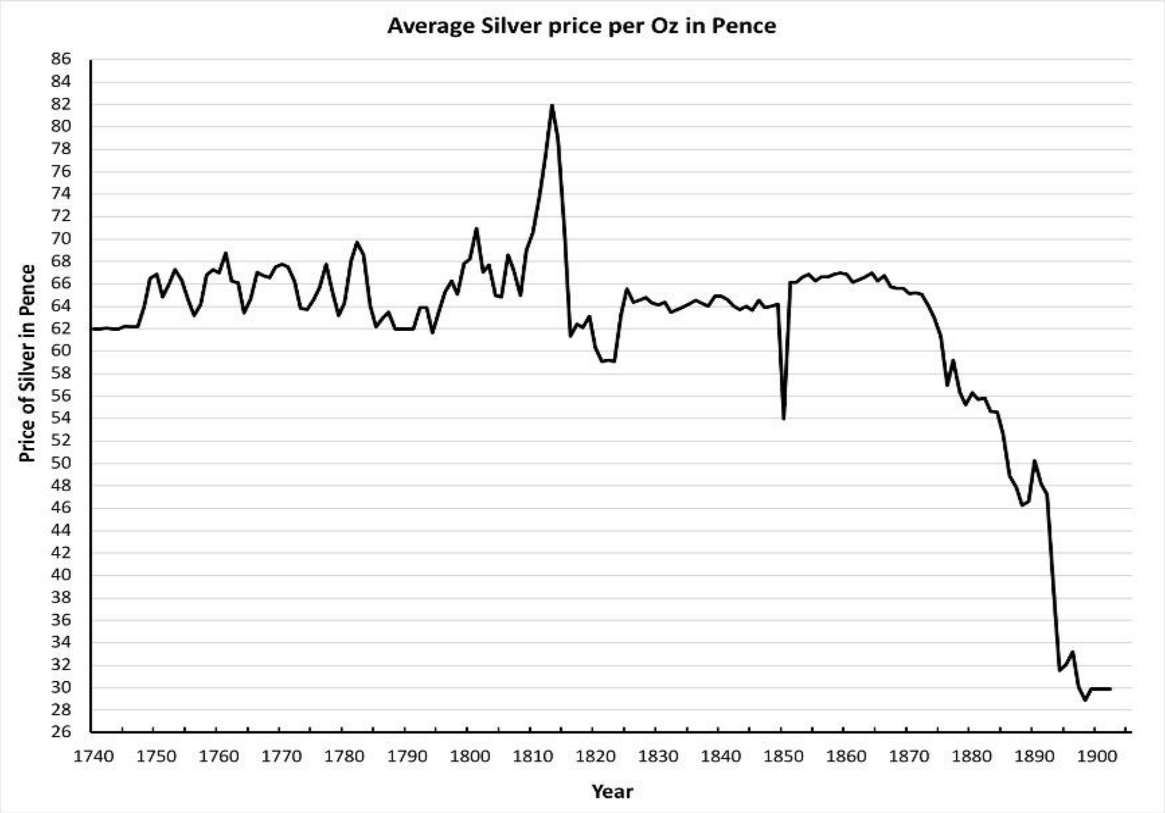
The company recorded the following silver sales.

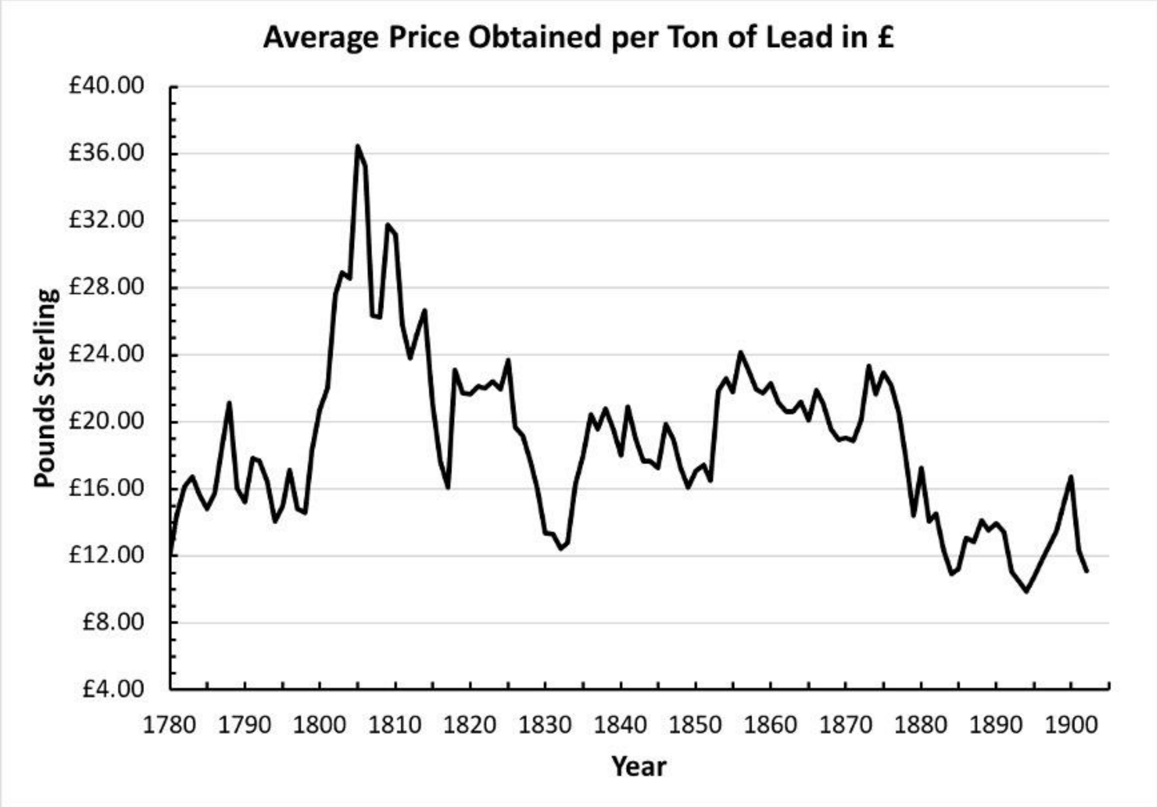
Year	**Ounces of silver**	**Pounds Sterling**
1705-1729	381,603	98,567
1730-1754	424593	112,323
1755-1779	558,203	153,126
1780-1804	481,553	129,704
1805-1829	569,353	154,739
1830-1854	1,059,831	283,453
1855-1879	1,500,979	399,834
1880-1899	975670	191,093
Totals	**5,951,785**	**1,522,839**

These large quantities of silver obtained enabled the company to continue to work despite the disastrous drop in the price obtained for their lead.


Money obtained from Lead Sales in £
£200,000
£190,000
£180,000
£170,000
£160,000
£150,000
£140,000
£130,000
£120,000
£110,000
£100,000
£90,000
£80,000
£70,000
£60,000
£50,000
£40,000
£30,000
£20,000
£10,000
£0
Pounds Sterling
1780
1790
1800
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
Year


Value of Silver Sold in £
£34,000
£32,000
£30,000
£28,000
£26,000
£24,000
£22,000
£20,000
£18,000
£16,000
£14,000
£12,000
£10,000
£8,000
£6,000
£4,000
£2,000
£0
Pounds Sterling
1780
1790
1800
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
Year


Average Silver price per Oz in Pence
Price of Silver in Pence
86
84
82
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
1740
1750
1760
1770
1780
1790
1800
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
Year


Average Price Obtained per Ton of Lead in £
Pounds Sterling
£40.00
£36.00
£32.00
£28.00
£24.00
£20.00
£16.00
£12.00
£8.00
£4.00
1780
1790
1800
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
Year

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[1] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 3.
[2] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 12.
[3] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 21.
[4] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 1.
[5] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 3.
[6] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO672/E/1E/7.
[7] Children's Employment Commission First Report Mines 1842. James Mitchell. Pg. 737.
[8] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 5.
[9] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 3.
[10] Northumberland Record Office NRO 324/W3/12
[11] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 3.
[12] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 5.
[13] Ibid.
[14] Ibid.
[15] Ibid.
[16] Ibid.
[17] General Index Book of the LLC. DX2282/4
[18] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 5
[19] Ibid.
[20] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 5.
[21] London Lead Company General Court Minutes. N.E.I.M.M.E. LLC 38.
[22] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 11.
[23] Lead Mining Districts of the North of England. Joseph Dickinson 1900/02. Transactions of the Manchester Geological Society Volume 27.
[24] London Lead Company Report Book 1806 – 1820. N.E.I.M.M.E. LLC 40.
[25] General Index Book of the LLC. DX2282/4
[26] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 6.
[27] Ibid. LLC 12.
[28] Transactions of the Society of Arts, Manufacturers and Commerce. Volume 5.
[29] Children's Employment Commission First Report Mines 1842, pg. 759. James Mitchell.
[30] LLC, Alston Mining Journal DX 2282
[31] An Account of the Mining District of Alston Moor, Weardale and Teesdale. T. Sopwith 1833.
[32] Cumbria Record Office Carlisle, Walton papers D/WAL/21.
[33] London Lead Company Report Book 1806 – 1820. N.E.I.M.M.E. LLC 40.
[34] A History of Lead Mining in the Pennines, pg. 237. A. Raistrick & B. Jennings 1989.
[35] London Lead Company Report Book 1806 – 1820. Northumberland Record Office LLC 40.
[36] Greenwich Hospital 1823 Report. E. H. Locker.
[37] A History of Lead Mining in the Pennines, pg. 189. A. Raistrick & B. Jennings 1989.
[38] London Lead Company Report Book 1806 – 1820. N.E.I.M.M.E. LLC 40.
[39] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 5.
[40] LLC, Alston Mining Journal DX 2282
[41] Ibid. LLC 14.
[42] London Lead Company Report Book 1806 – 1820. N.E.I.M.M.E. LLC 40.
[43] London Lead Company Half Yearly General Court Minutes. N.E.I.M.M.E. LLC 39.
[44] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 33.
[45] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 34.
[46] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 35.
[47] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 14.
[48] Conditions in Mines to which the provisions of the Act 23 and 24 do not apply with reference to the health and safety of persons employed 1864. Kinnaird report.
[49] Children's Employment Commission First Report Mines 1842, pg. 736. James Mitchell.
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[52] The production of Galena and Associated Minerals in the Northern Pennines; with comparative statistics for Great Britain. Kingsley Dunham. Paper issued 11th January 1844 submitted for discussion at a meeting of the Institution of Mining and Metallurgy, London on 20th January 1944.

[53] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO 672/E/1E/2.

[54] Newcastle Courant 29 May 1779. Newcastle City Library Local History Department.

[55] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO 672/E/1E/3.

[56] The Abstract of British Historical Statistics. B. R. Mitchell & P. Deane 1962.

[57] The British Lead Mining Industry. Roger Burt 1984.

[58] The Abstract of British Historical Statistics. B. R. Mitchell & P. Deane 1962.

[59] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO 672/E/1E/6.

[60] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO 672/E/1E/5.

[61] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 16.

[62] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO 672/E/1E/5.

[63] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO 672/E/1E/6.

[64] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 33.

[65] Letter Book of the Blackett Beaumont Lead Company. Northumberland Record Office NRO 672/E/1E/5.

[66] Ibid.

[67] London Lead Company Half Yearly General Court Minutes. N.E.I.M.M.E. LLC 39.

[68] Lead production figures after 1899 are obtained from the ‘Letter Book of James S Hyslop Upper Teesdale Lead Mine Bailiff Raby Estate’ (NRO 3410/ZE/4)

[69] London Lead Company Court Minutes. N.E.I.M.M.E. LLC 37.

[70] N.E.I.M.M.E./ZE/4/413-415

[71] Raby Estate Records. Northumberland Record Office NRO 3410.

N.E.I.M.M.E. The library of the North of England Institute of Mining and Mechanical Engineers.

NRO. Northumberland Record Office